American Machinist

JANUARY 13, 1958 PRICE 75 CENTS

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Shop practice for short runs

page 97

How Link-Belt got a new plant... without building one

Full-color story tells how a modern plant was fitted in a group of old buildings by modernizing:

- Layout
- Machining methods
- Stores
- Assembly
- Testing
- Production control

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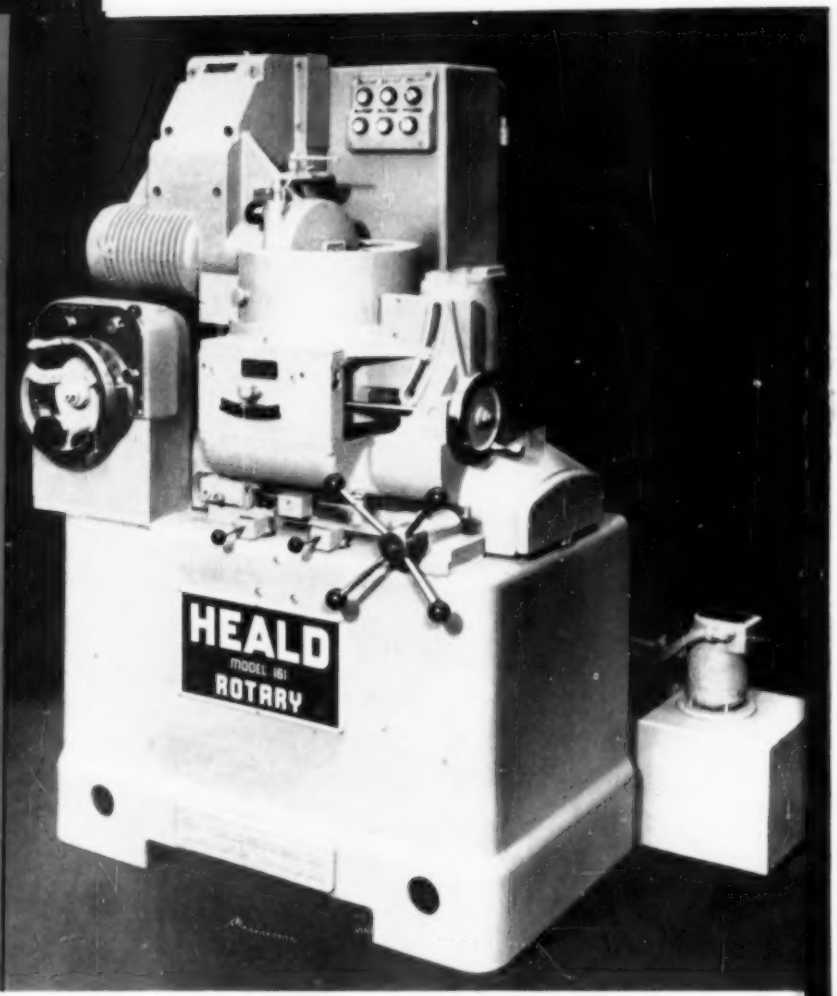
Dontometer inspects ultra-precise spur gears—see page 2

Dontometer inspects ultra-precise spur gears—see page

There's a NEW LOOK and NEW PERFORMANCE in this 1958 Model!



Here's what the new Model 161 Rotary can do for you...

Greater Precision — Dial knob type feed box now permits incremented feeds of .0001 from 0 to .0006 for rough grinding, changing automatically to .0001 fine feed at any point from 0 to .005 before finish size.

Finer Finish — Rugged cradle-type chuck bracket and swivel adjustment minimizes chatter. And vibration-free diamond unit gives wheel a smoother dress.

Easier Operation — Anti-friction table ways give easier manual reciprocation. Four ounce pressure moves the 590 lb. table.

Higher Production — Hydraulic table feed rates infinitely variable from 0 to 10 fpm. Permits smooth slow dressing speed, changeable instantly to rapid traverse or reciprocating speed.

Greater Versatility — A manually operated machine is easily changed over to hydraulic operation simply by adding a power pack.

Less Maintenance — Anti-friction table and base ways are grease packed for life and sealed to exclude foreign matter. Hydraulic table design minimizes spare parts inventory and reduces maintenance and attention.

The 1958 Model 161 Rotary Surface Grinder is ideally suited to all small work grinding operations, on a high production or job-lot basis. Grinds flat, convex or concave surfaces of work up to 6 in. O.D. For complete information, send today for Bulletin 2-161-2 Issue 1.

IT PAYS TO COME TO HEALD!

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American Machinist
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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SPECIAL REPORT NO. 455

How Link-Belt got a new plant without building one . . . The Philadelphia plant, crammed into a score of old buildings has a new layout, much new equipment, new efficiency and a new outlook. *By Anderson Ashburn* 129

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American Machinist chips

Cover . . .
Gear analyzer developed by Sperry Gyroscope Co to check ultra-precise gears. See details on page 113 and below left.

New plant, old building . . . In recent years we've seen many cases in which new plants built from scratch have represented models of efficiency in layout, equipment, and materials handling procedures. This has perhaps led some to think that, "I'm stuck with an old building—what can I do?" When we first heard about Link-Belt's Philadelphia story, we thought it was an inspiring demonstration of what you can do despite the handicap of not one old building, but 27.

The Philadelphia Story starts when one of the two departments crammed into a complex collection of old buildings was moved to a new plant. The department left behind had a chance at last to study and rearrange the layout. Plant engineering went to work. Step by step a new concept took form. Credit for the changes must go to the entire staff of the plant, but we want especially to mention the roles of R B Holmes, manager, W A Morley, general superintendent, and J R Clemons, who was in plant engineering but now is superintendent of the assembly department. Anderson Ashburn, managing editor, has been watching the changes as they took place and tells the story of "How Link-Belt got a new plant without building one" in the Special Report starting on page 129. The story is illustrated with full-color pictures that emphasize the modern, colorful, and efficient operation that can be achieved by doing a thorough modernization and replacement job on an old plant.

In the same vein, Donald Pennock of Carrier Corp gives some practical advice on how to design a handling system to suit the building. Page 118.

Electrolytic grinding, first proposed as a means to grind carbides, is showing up to advantage on many difficult materials. We bring you two reports on the subject. One telling how it is being applied, the other summarizing troubles that can develop and telling how to avoid them. See page 106.

Coming . . . *AM* for January 27 will be our 1958 Production Preview issue. You will find a summary of all the new equipment introduced during the past year—the equipment that can put new life into your plant in 1958.

R J Ross was engineering coordinator for the design of the evaluation instruments on new gyroscope and accelerometers at Sperry Gyroscope Co and is now supervisor of the engineering section of industrial research and development. A graduate of the Polytechnic Institute of Brooklyn with both his Bachelor's and Master's degrees in mechanical engineering, Ron joined Sperry in 1950, after two years research at Brooklyn Poly. He was also responsible for the development of Sperry's facility to produce ultra-precise gears (*AM*—May 21 '56, p129).

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Now...*controlled hardening* of wearing surfaces

With these new Gleason machines you can make metal surfaces on couplings, splines, and other parts more wear-resistant by surface hardening.

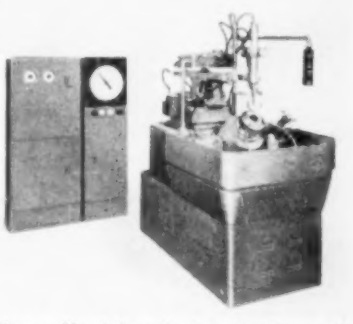
In the setup shown, the machine heats all twelve teeth of a coupling at once with a twelve-tip oxyacetylene burner. Indexing of work to the burners is automatically controlled.

A cam-controlled burner motion provides an oscillating movement of the burner tips to assure uniform penetration of the heating. This oscillating action in conjunction with electric timers controls the depth of hardness.

There is no measurable distortion because only the coupling teeth are heated and each tooth is heated uniformly on both sides, and the hardness is limited to the wearing surfaces. The life of the part is greatly increased.

You can set up the machine for small as well as volume production of parts up to 12″ diameter. Both ways, the machine is completely automatic except for loading.

This is one of a series of Gleason machines for hardening metal parts including bevel and hypoid gears and spur and helical gears. For additional information write for our bulletin. *Complete coupling is surface-hardened* in a single pass on the Gleason No. 108 Surface Hardening Machine.



Gleason No. 1 Gear Surface Hardener with electronic control unit. Accommodates bevel gears up to 24″ pitch diameter, spur and helical gears up to 30″, internal gears up to 24″ outside diameter.

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Builders of bevel gear machinery for over 90 years

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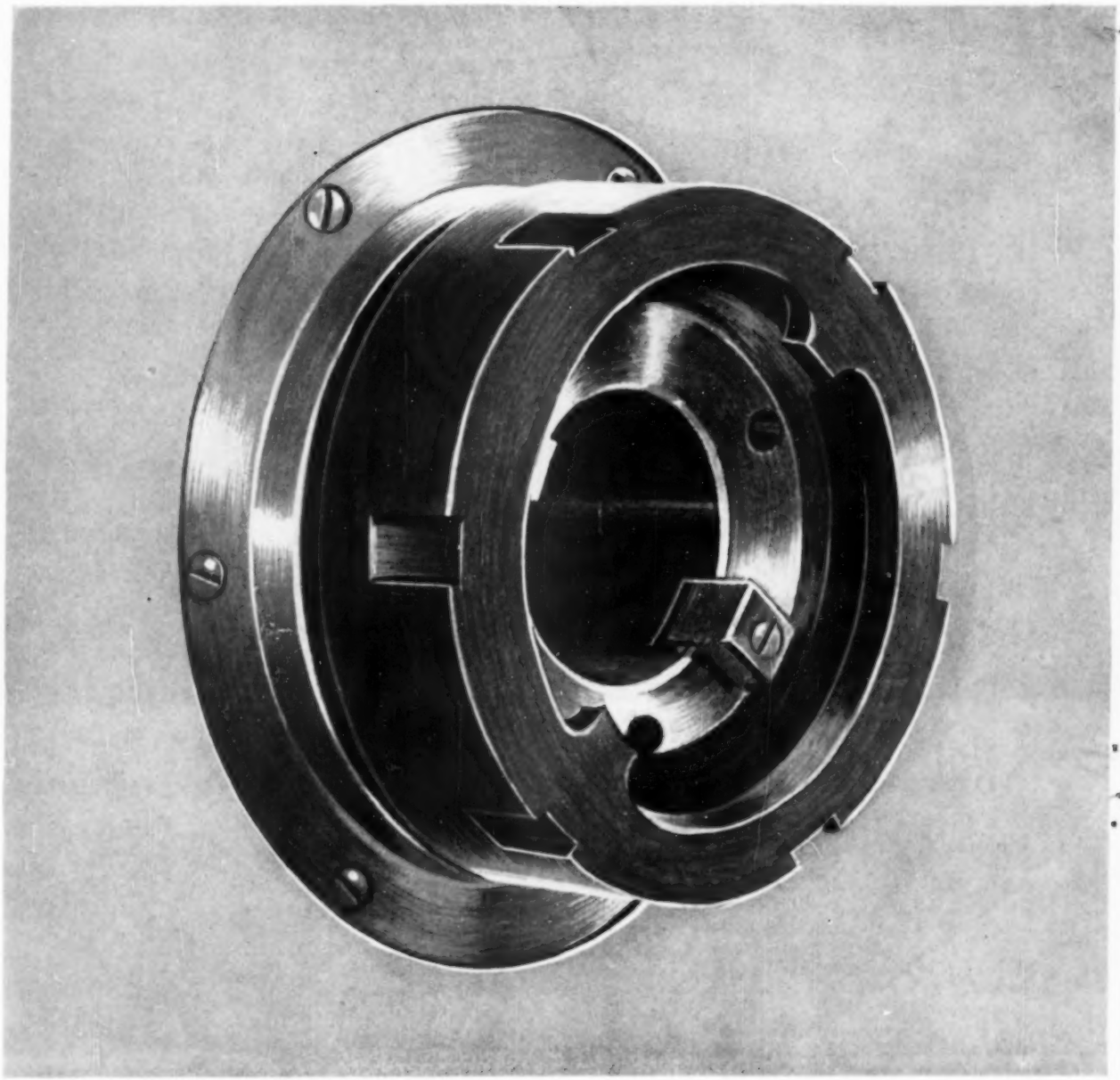
ARBOR-LOC® spindle



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MILLING MACHINES • BROACHING MACHINES • CUTTER
METAL FORMING MACHINES • HARDENING MACHINES

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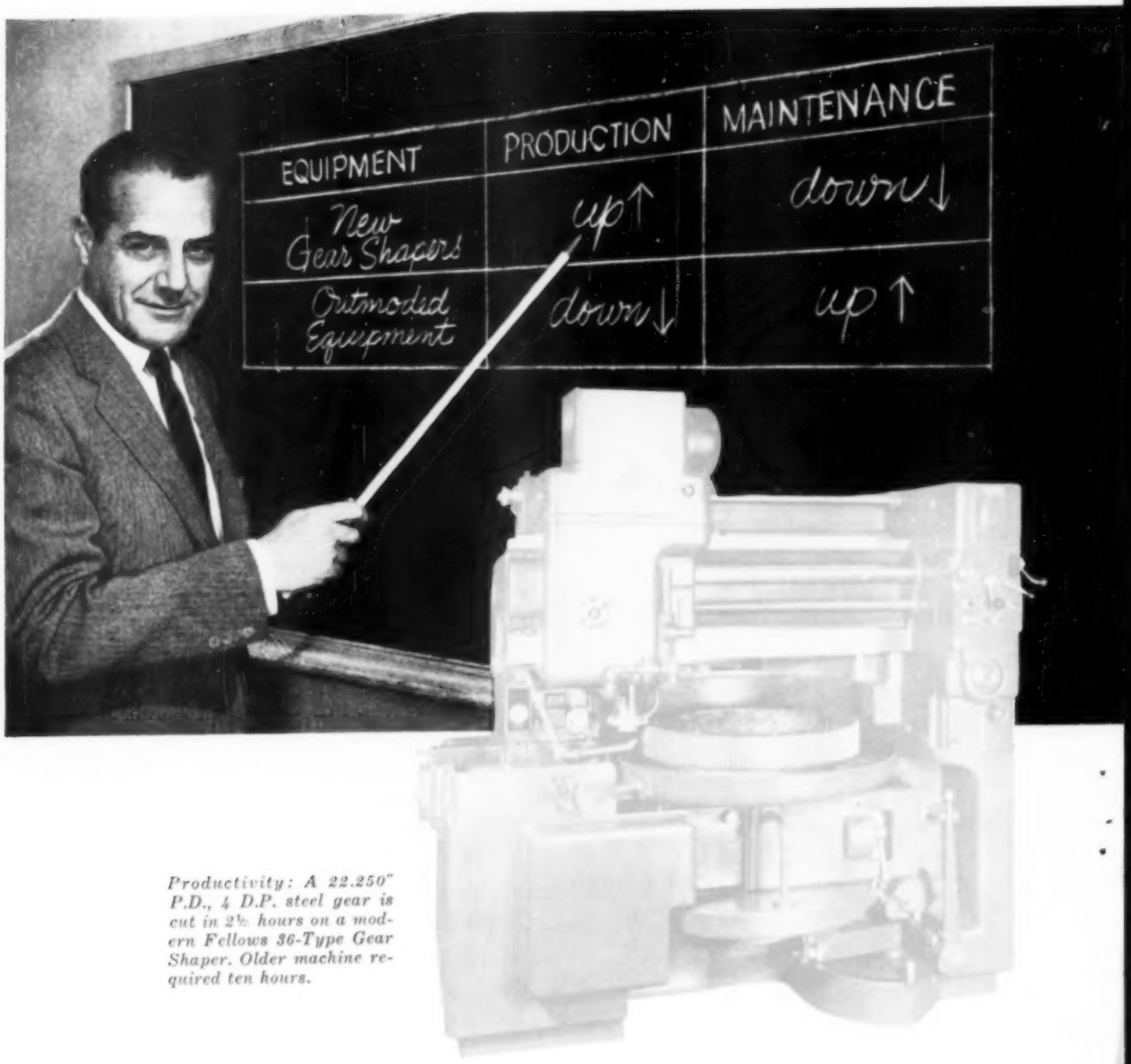
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

Modernize FOR



Productivity: A 22.250" P.D., 4 D.P. steel gear is cut in 2½ hours on a modern Fellows 36-Type Gear Shaper. Older machine required ten hours.

THE PRECISION LINE

LOWER COSTS

with new FELLOWS 36-TYPE Gear Shapers

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Fast, accurate, and simple to set up for a wide range of jobs up to 36″ P.D., the Fellows 36-Type is ideal for short runs of varied parts as well as for long runs. Rigid, husky construction permits close tolerances on internal or external spurs, helicals, and herringbones, as well as an almost unlimited variety of cams, splines, and other non-involute shapes. Cutter speeds range from 18 to 300 strokes per minute.

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...to make
quality

...so SIKORSKY
uses MORSE
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And you can say the same things about Morse *Electrolized* Tools, used in construction of the S-58. *Dependability* on the toughest jobs. *Increased payload* . . . because Morse *Electrolized* Tools last up to 100% longer. *Improved performance* . . . because every hole is smoothly and accurately drilled.

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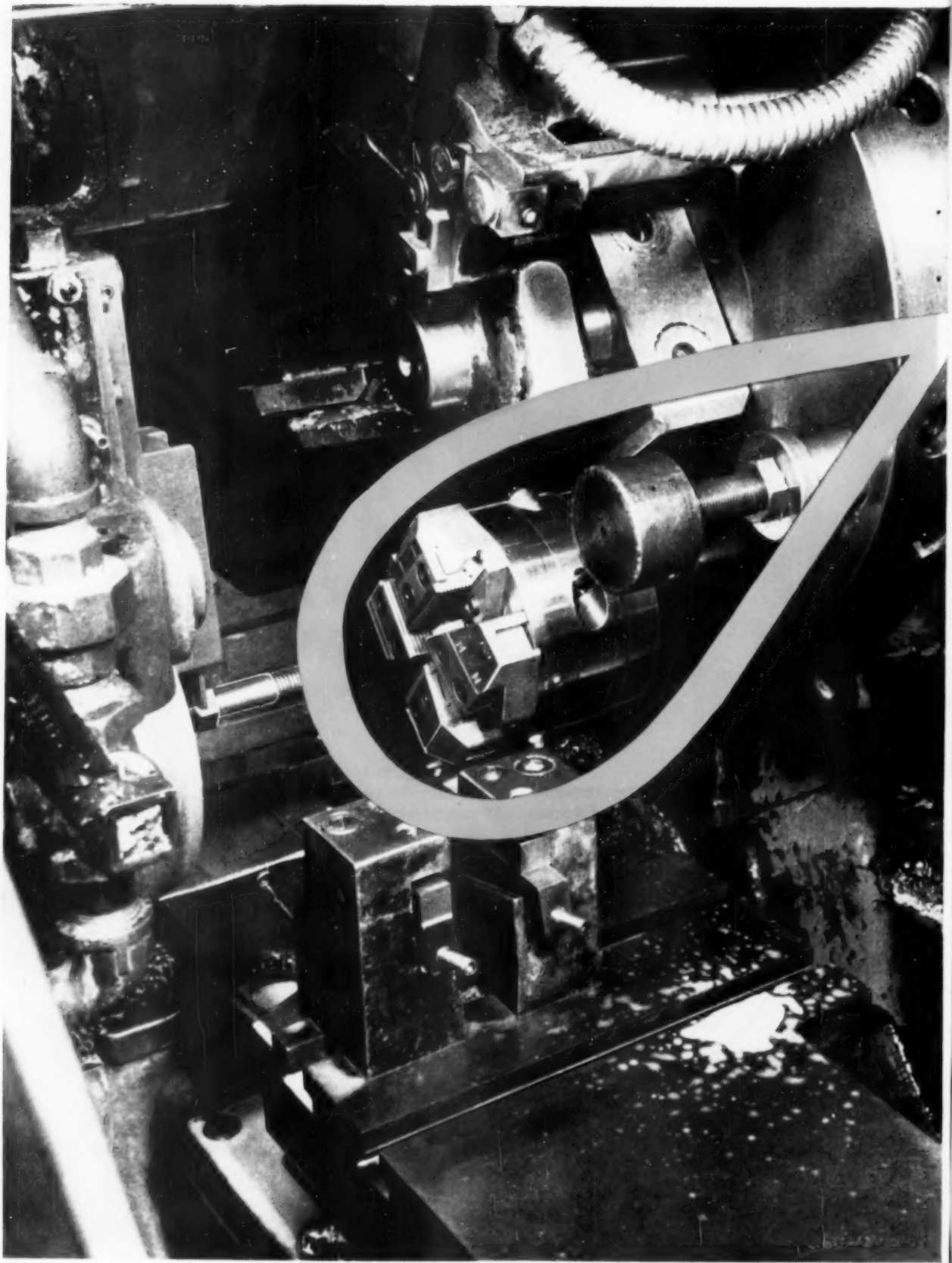
means "THE MOST" in Cutting Tools



AUTOMATIC THREADING

to close tolerances on single-spindle automatic

Automatic opening and closing and *ability to meet exacting concentricity requirements* were the principal reasons a LANDIS Die Head was selected to thread drive wheel cap screws for industrial lift trucks manufactured at the Yale Materials Handling Division of The Yale and Towne Mfg. Co. in Philadelphia, Pa.

$\frac{5}{8}$", 11-pitch UNC threads are cut $\frac{7}{8}$" long on 3140 steel by a LANDMATIC Head on a Cleveland Single-Spindle Screw Machine. Threads must meet Class 3 tolerances—in addition, the threads must be concentric with the screw body within .002".

A 1-$\frac{1}{4}$" FD LANDMATIC Head is being used for this work—a stationary, self-opening head arranged for automatic closing. A special over-travel feature eliminates the necessity of a complicated, accurately-set closing cam on the machine. Threads are produced to necessary tolerances at 18 SFM, with 400 pieces completed between chaser grinds.

This head, other than the over-travel feature, is a standard LANDMATIC Heat-Treated Head (primarily used for turret lathe threading) equipped with standard LANDIS Tangential Chasers. Even with this tough material, close tolerances are met with an excellent number of pieces between grinds. Further economies are realized as the chasers with regrinding will produce these threads for 80% of their original length. Wide range and oversize capacity are important features of the head—$\frac{1}{4}$" to 1-$\frac{1}{4}$" normal range, short thread lengths up to 2-$\frac{3}{4}$" in diameter with oversize chaser holders.

A wide variety of sizes and types of LANDIS Heads allow you to gain the utmost "threading efficiency". Send us your specifications and ask for Bulletins F-80 and F-90—let us suggest the LANDIS Head most suitable for your needs.

LANDIS *Machine* COMPANY
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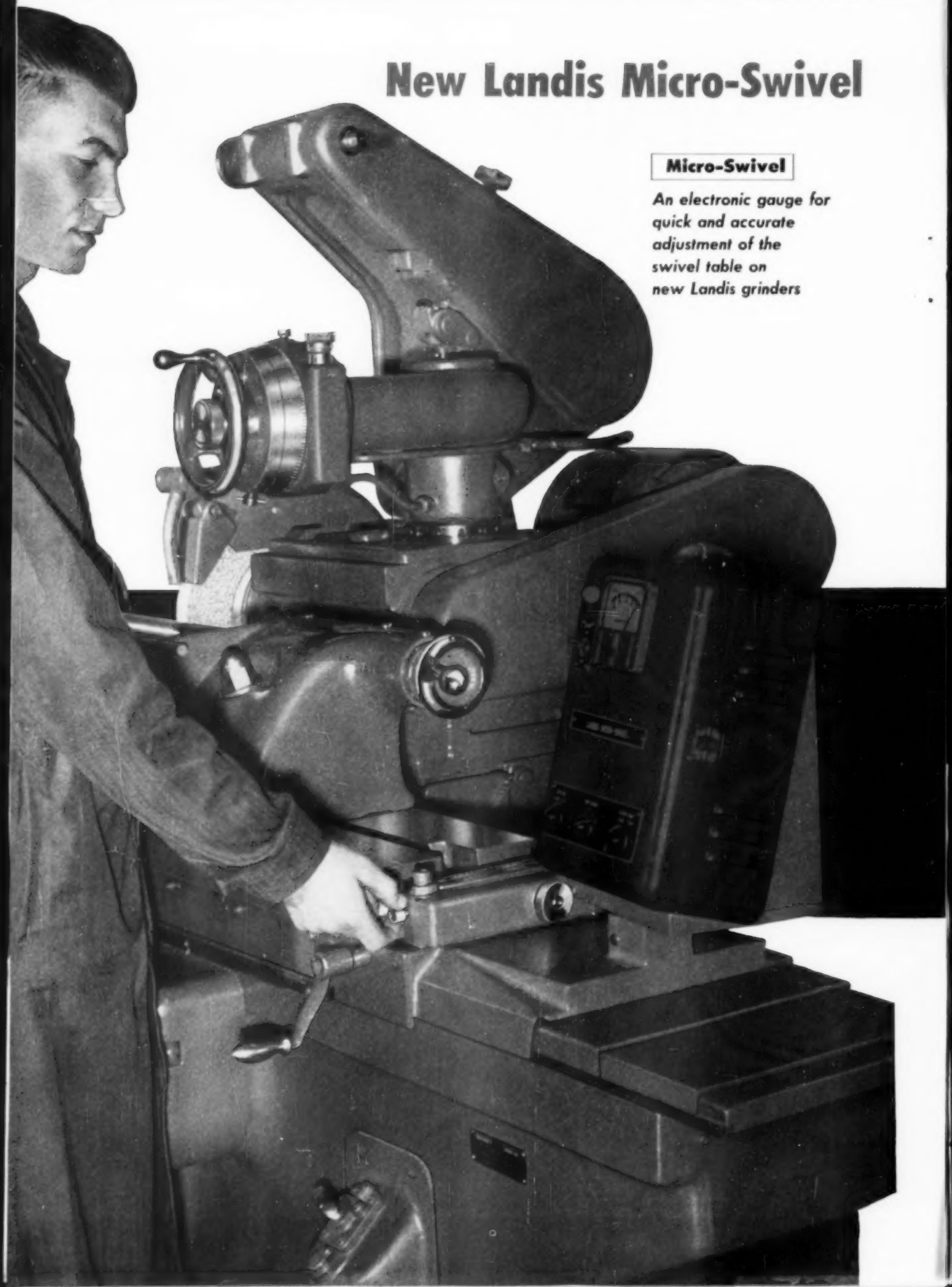
476C

New Landis Micro-Swivel



Micro-Swivel

An electronic gauge for quick and accurate adjustment of the swivel table on new Landis grinders

saves setup time on Landis grinders

gives these time saving benefits

Eliminates cut and try in setup
Gives precision alignment quickly
Reads in "tenths" or "thousandths"
Easy to use; even for unskilled operators

advanced features make Landis Micro-Swivel "best available"

One turn of knob sets detector regardless of table swivel position
Direct reading—no calculations necessary
No pushrods, chucks or set-latches to adjust
Rugged shop-type unit; cannot be jammed
Printed circuit—moisture proof
Separate readings for headstock and footstock ends of table

LANDIS

precision grinders

LANDIS TOOL COMPANY
WAYNESBORO, PENNA.

BORING, DRILLING AND
MILLING

Greater rigidity is the key! Square lock, full length headstock gibbing on 30 Series table-type Horizontals provides exceptional rigidity for faster, heavier milling cuts, better finishes

Today's demands for "getting out the work at more profit" require full utilization of every machine tool. That means faster, heavier cutting *without* losing finish or accuracy. Such efficiency calls for *extra rigidity!* And G&L 30 Series table-type Horizontal boring, drilling and milling machines *give you more of it!* Because these Horizontals can bore, drill, mill . . . tap, ream, counterbore — do so *many jobs* in fewer setups — they are one of the most profitable machine investments you can make.

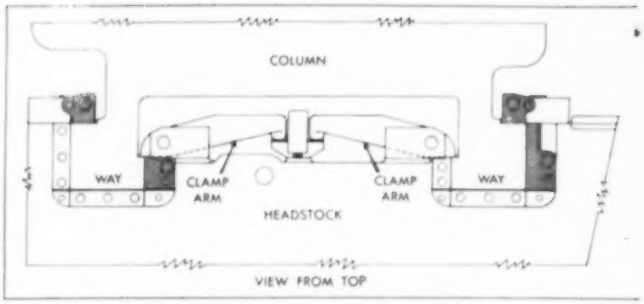
For all these important machining operations, G&L offers you greater headstock rigidity. By locating full-length headstock gibs at the four points shown in drawing at right, maximum rigidity is attained . . . overcoming twists and strains of heavy milling. G&L spindle rigidity is further increased by the sleeve, ram and adjustable take-up collet.

These Horizontals give you positive, hardened and ground, all-geared spindle drive plus high torque and full power you need for efficient milling at low or high speeds. You get 45 separate spindle speeds in fine increments. Trouble-free mechanical G&L directional controls save time, eliminate error. Machine units move in same direction levers are moved. This action is especially valuable in profile milling operations using the 18 independent milling feeds for headstock, table and saddle.

For more 30 Series table-type Horizontal machine details, contact your nearest G&L representative or write direct.

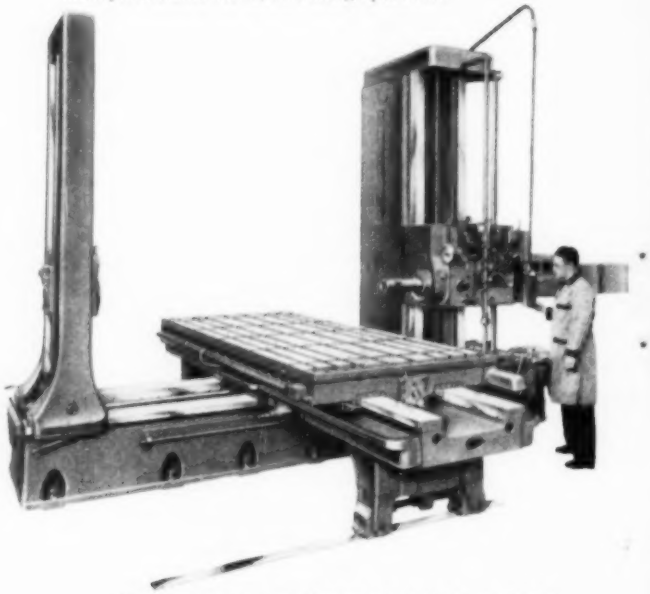
G&L attachments and accessories that extend machining possibilities and profits

The world's broadest range of optional equipment brings maximum return on your machine investment: angular milling attachments, continuous feed facing heads, Dupli-Tracer electronic contour and profiling system, automatic electric positioning and improved measuring devices and a complete line of Davis tooling.



Headstock gibbing guarantees maximum rigidity for travel on heavy, square column ways

Solid, square-lock headstock gib design completely transmits all milling forces to massive, heavily ribbed column. Self-equalizing arms clamp headstock firmly and with equal pressure to wide faces of both column ways. Headstock is guided across both ways with a solid bearing on the front way located close to cutter. This rugged design assures optimum performance for all machining operations.



The 30 Series line of Horizontals includes the Model 350-T with 5" dia. spindle (25 hp) and Model 340-T with 4" dia. spindle (20 hp). Both machines offer a broad choice of headstock, table and saddle travel. Other horizontal boring machines are offered in spindle diameters ranging from 3" to 14" . . . main motor drives 10-150 hp.

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GIDDINGS & LEWIS MACHINE TOOL CO.
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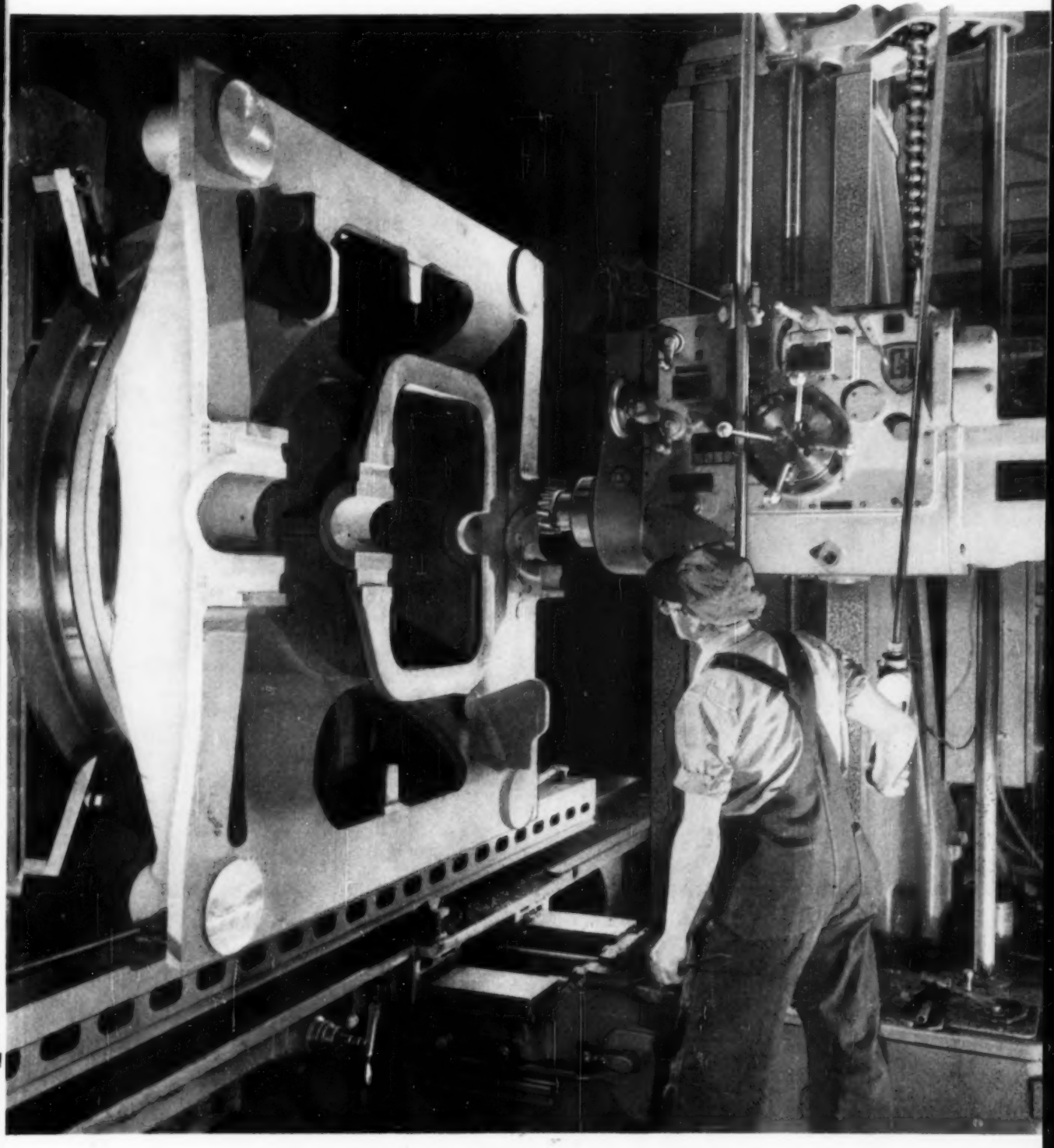
G-87

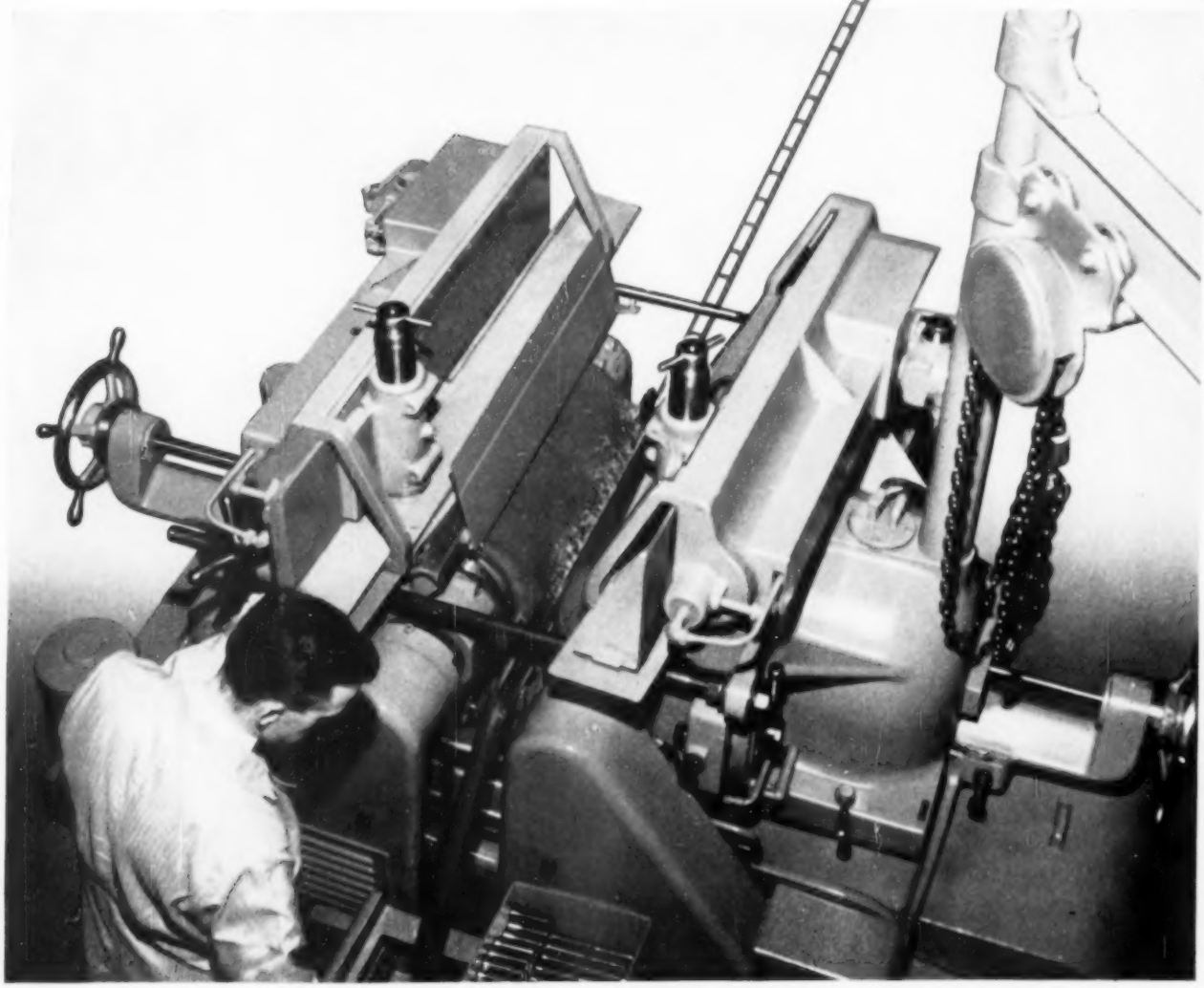
Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines and VARIAX Profile Milling Machines.

. . . why Giddings & Lewis Horizontals perform milling and other operations faster, at lower cost to you



Three-ton steel carbody (6′ x 5½′) for excavator is rough and finish milled on this G&L Model 350-T Horizontal. Operations include rough and finish mill the corner pads, bosses, brackets . . . gear case, hub and bearing faces.

You can have Precision Gage Quality . . . and



Piston pins are centerless lapped on a CINCINNATI to uniform size and free of amorphous metal . . . another example of Cincinnati's ability to meet your quality and precision finishing requirements.

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CINCINNATI

CINCINNATI®

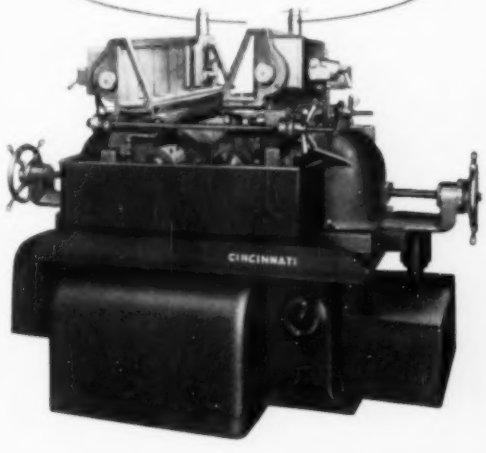
High Production Rates, *Too!*

. . . it's routine performance for

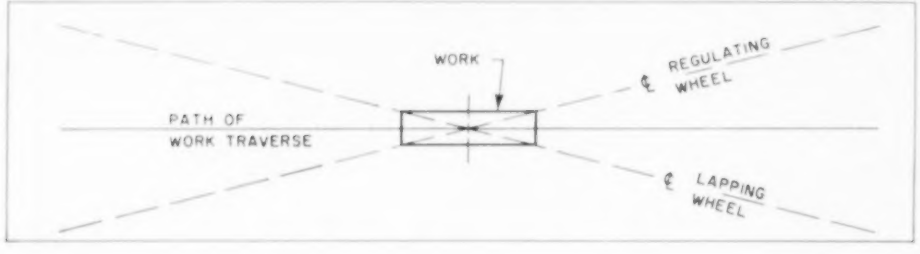
Cincinnati Filmatic Centerless Lapping Machines

Yesterday's precision gage tolerances are today's production tolerances. But it takes a little something extra in methods and equipment to obtain such high quality at an acceptable cost. Consider precision thru-feed centerless grinding. Follow it with one or more operations (passes) on CINCINNATI® FILMATIC Centerless Lapping Machines and you will obtain consistently superior quality . . . finishes within 1 to 4 micro-inch and tolerances within .000025" to .00005", depending upon number of operations (passes) and care employed. ¶ One secret of the ultra high-quality work produced by CINCINNATI FILMATIC Centerless Lapping Machines is this: the lapping wheel contacts the work at an angle different from that of a grinding machine, quickly eliminating grinding wheel marks. Of course, the amount of stock removed is rather small; about .0005" on the diameter. ¶ Both the regulating and lapping wheels are mounted on FILMATIC spindle bearings contained in cartridges for convenience in changing wheels. These bearings are head and shoulders above any other spindle mounting; they are largely responsible for the amazing accuracy obtainable on production work passing between the wheels of CINCINNATI FILMATIC Centerless Lapping Machines. Other features contributing to the low cost of extra high-quality performance include infinitely variable regulating wheel speeds . . . solid support on both sides of the wheels . . . hydraulic truing for both wheels. You will find more information in Sweet's Machine Tool File. For complete data, write for catalog No. G-683.

CINCINNATI FILMATIC CENTERLESS LAPPING MACHINE
Catalog No. G-683

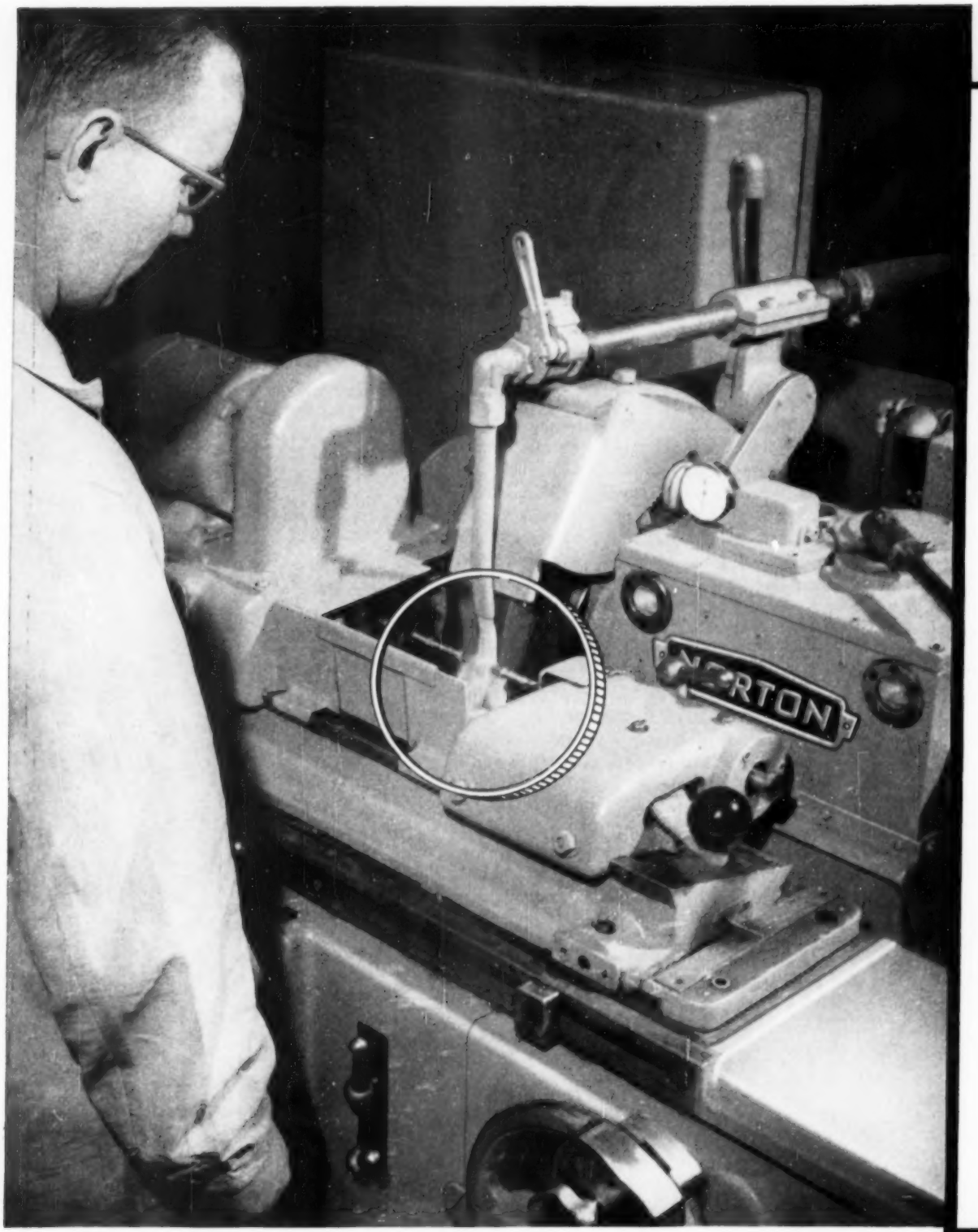


CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



Drawing shows relation between center line of lapping wheel and work traverse. Angular contact of lapping wheel on work *produces the highest quality finish obtainable on production work.*

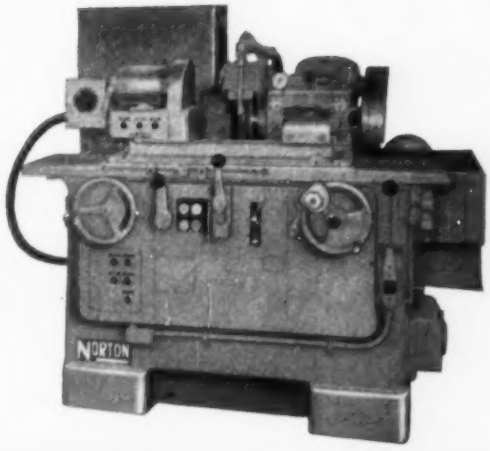
CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES



HIGH PRECISION PLUS HIGH PRODUCTION. Long-lasting accuracy is built into the 4" x 18" Type CTU cylindrical grinder — together with many Norton "Touch of Gold" features that reduce operators' duties and speed production. Remember: only Norton offers you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost.

Norton 4" x 18" Type CTU cylindrical grinder

makes small parts pay off big



Here's a cylindrical grinder you can get as either a Plain Machine for traverse work, or as a Semiautomatic for plunge operations.

Either way you get faster, more accurate, more profitable grinding of a wide variety of small parts. Because either way the 4" Type CTU's Norton-developed features bring a new ease of operation for your men — and a new high in production quality and quantity for *you*.

For example, there's the extremely rugged wheel spindle unit that assures enduring precision in jobs ranging from heavy stock removal to fine finishing. Then there are optional profit-boosting extras like the new SWIVALIGN Dual Electric Indicator for measuring swivel table adjustment, and an Automatic Wheel Truing Device.

Get All the Facts

on how this fast, accurate grinder can add the profit-boosting "Touch of Gold" to your grinding operations. See your Norton Representative, or write direct for Catalog No. 531. And ask about the Norton Lease and Purchase Financing Plans that enable you to modernize while conserving your capital. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.

To Economize, Modernize with NEW

NORTON

GRINDERS and LAPPERS

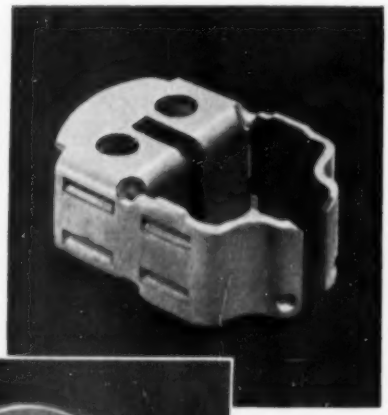
Making better products . . . to make your products better

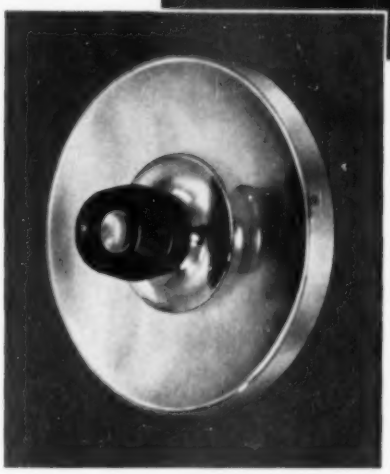
NORTON PRODUCTS: Abrasives, Grinding Wheels, Grinding Machines, Refractories
BEHR-MANNING PRODUCTS: Coated Abrasives, Sharpening Stones, Behr-cut Tapes

District Offices: Worcester • Hartford • New York Area Teterboro, New Jersey • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5, Ontario

ON JOBS LIKE THIS CORBIN TURNS TO

U.S. MULTI-SLIDES®





The Corbin ball bearing latch bolt retractor is just one of a multitude of stampings which can be produced — complete, without secondary operations, handlings or inspections — on U. S. Multi-Slide Machines. In the U. S. Multi-Slide, a combination of motions built into the machine itself greatly simplifies the designing of tools to fabricate precision formed metal stampings. Because these motions are part of the standard machine equipment, it is not necessary to incorporate complicated movements into the dies. Standard equipment on the machine includes: ram action for cutting, piercing, trimming, embossing, etc.; a four-slide forming position; and vertical movement for stripping and transferring. U. S. Multi-Slide Machines are built in four sizes, and on the three larger units it is possible to use two or more rams simultaneously. These features make the U. S. Multi-Slide extremely versatile in the automatic, high-speed production of all types of formed metal stampings.

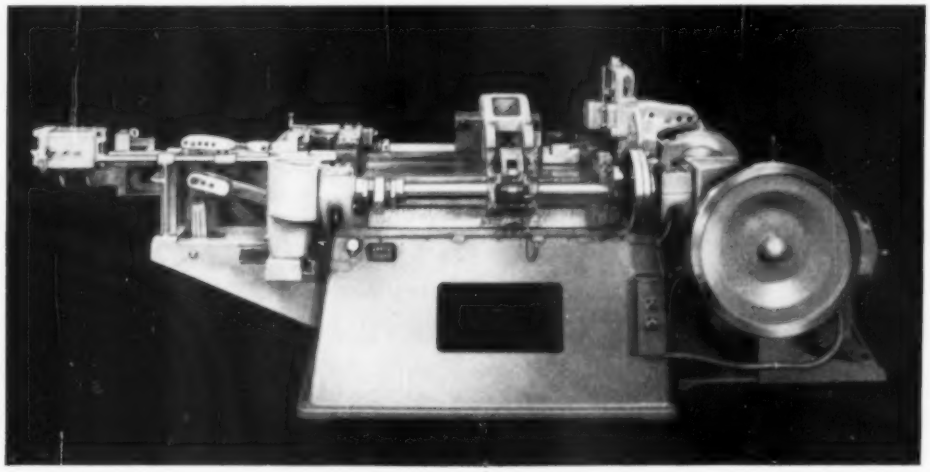
If you want to produce parts uniformly . . . at high speeds . . . and to close tolerances, write for a copy of Bulletin 15-A, or send part drawings or samples for our recommendations.

The Corbin Latch Bolt Retractor shown above illustrates the unique ability of the U. S. Multi-Slide to produce thousands of uniformly precise parts — faster and better. Completely formed to close tolerances from strip metal, this part is non-jamming, self-aligning and practically indestructible. Thus, it imparts to Corbin Locksets the famous "velvet glide" knob action, long life and trouble free service — qualities which were found previously only in higher priced custom units, but which are now, thanks to U. S. Multi-Slides, an integral part of every Corbin Standard Duty Residential Lockset.

U. S. TOOL COMPANY, Inc.

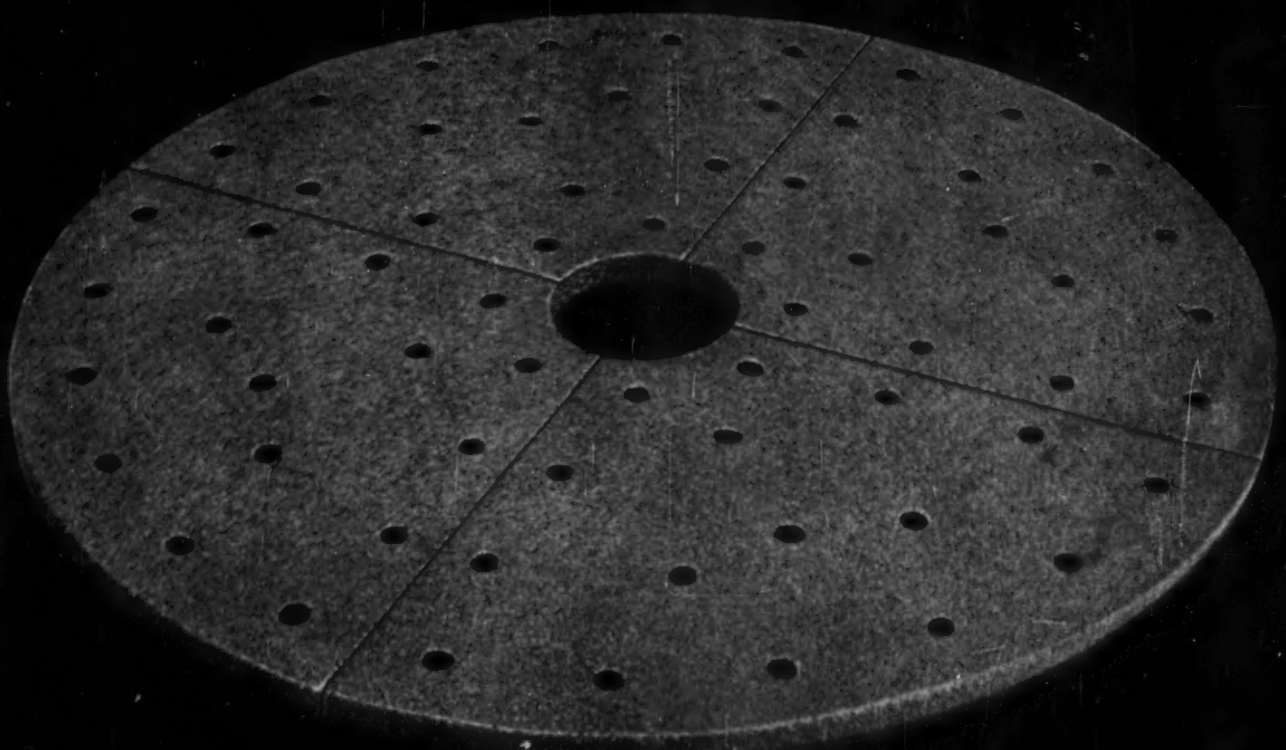
AMPERE (East Orange) **NEW JERSEY**

Builders of U. S. Multi-Slides — U. S. Multi-Millers
U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

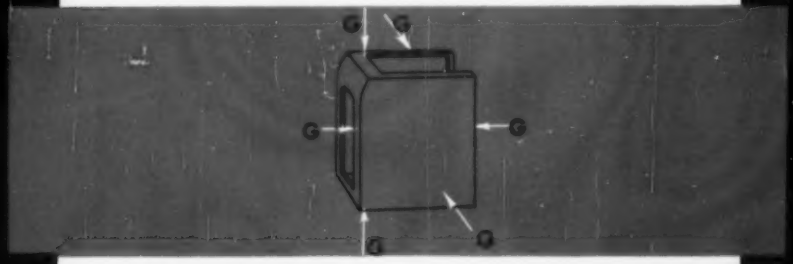


Left: The U. S. No. 35 Multi-Slide Machine used, with appropriate tooling, to produce the Corbin Latch Bolt Retractor shown above.

How disc life was increased from 5 days to 5 weeks



This production improvement on coin box grinding results directly from combined recommendations of *both* Gardner Machine Representative and Gardner Abrasives Specialist . . .



Gardner #124-53" horizontal disc grinder for continuous grinding of coin box surfaces.

Here's what was done:

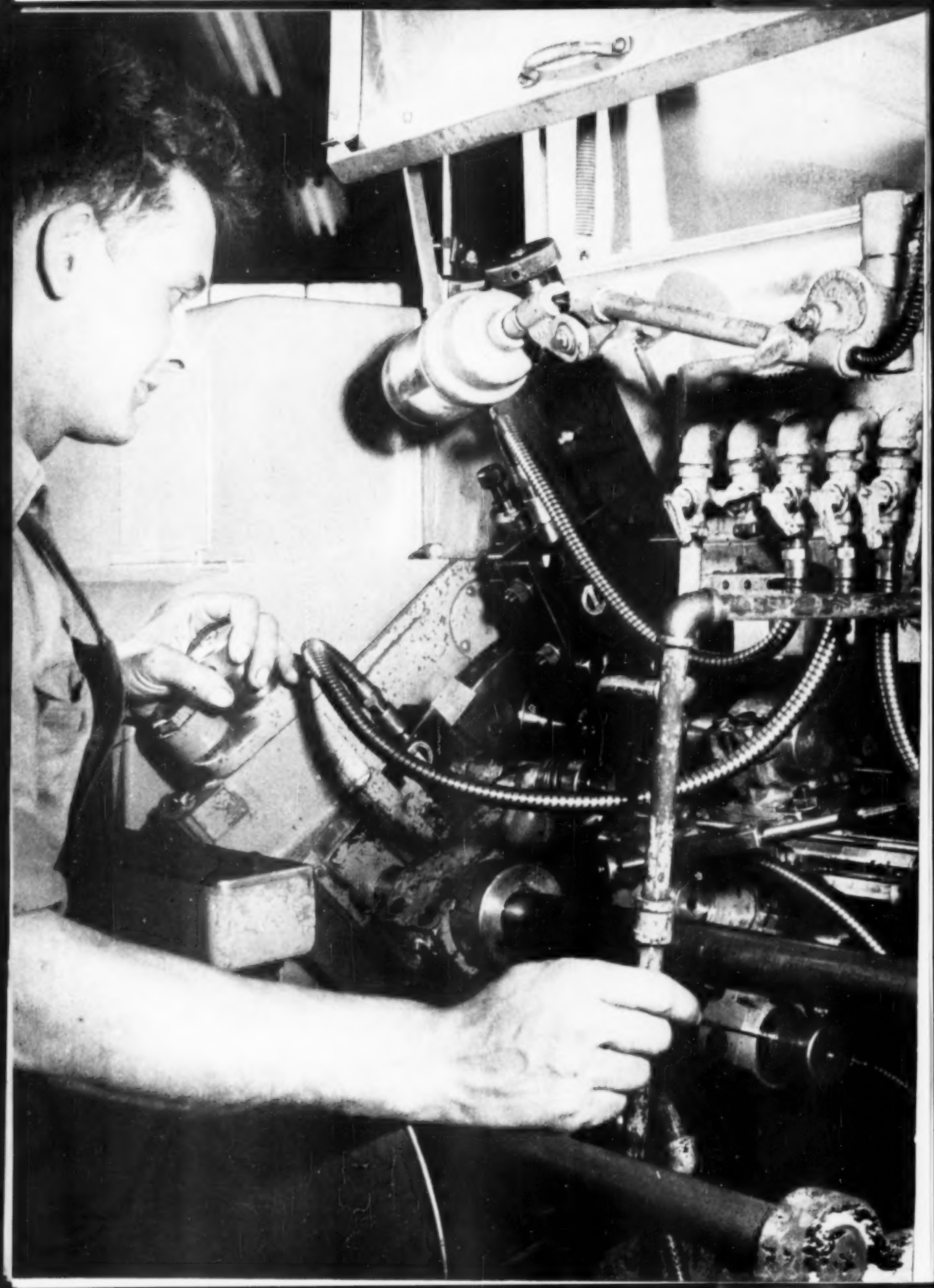
1. Disc specification revised
2. Dressing method changed
3. Minor adjustment in fixturing

For practical solutions to your disc grinding problems call Gardner for complete service.

GARDNER

abrasive discs

BELOIT, WISCONSIN



"Our Warner & Swasey 5-Spindle Automatics put us in business on small lot precision jobbing work..."

REPORTS **TROY MANUFACTURING CO.** WELSHFIELD, OHIO

Success of this progressive 6-man job shop has literally been founded on the ability of their 2¼-inch 5-Spindle Warner & Swasey Automatics to produce complex work accurately, in lots as small as 500 pieces with simple tooling and fast setups.

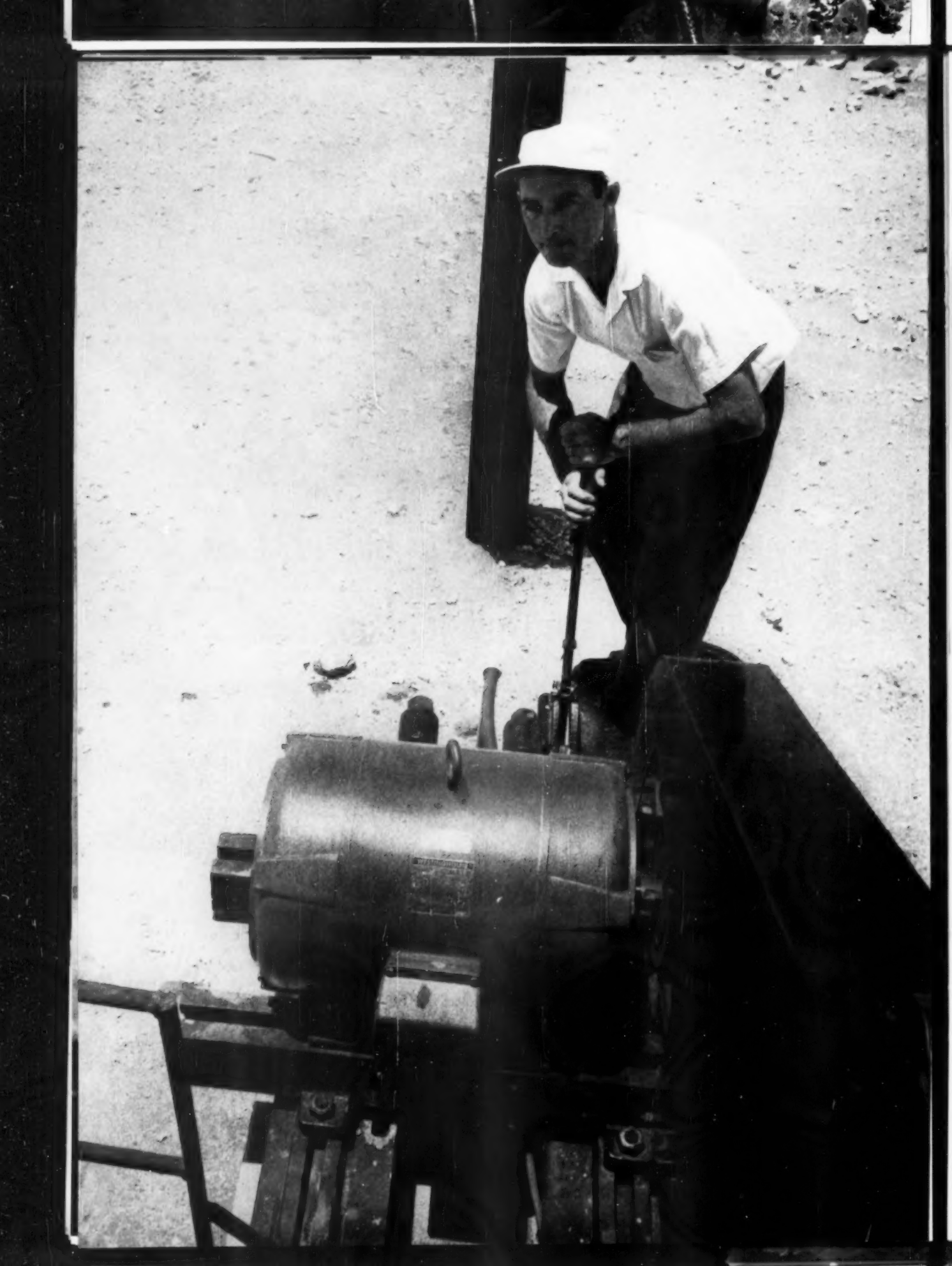
Generally accepted job shop practice precludes the use of multi-spindle operations because of the economics involved in the "set-up time—lot size" relationship. This ratio is usually quite large on conventional automatics—which eliminates them from all but the longest run jobs.

However, Troy Mfg. has found the reverse to be true in the operation of their two Warner & Swasey 5-Spindle Automatics. As Mr. Cseplo, Manager of Troy Mfg., explained, "Quick set-ups permit us to profitably handle small lot work, and on jobs requiring tolerances between .001" and .002" we seldom scrap a piece which I think is good multi-spindle work. We handle an extreme range of work size and materials in short runs, and the accuracy and versatility of our Warner & Swaseys are invaluable assets to a job shop operator."

Warner & Swasey Multi-Spindle Automatics can substantially cut your machining costs on small and medium lot production—as well as on longer runs. To get the complete story of how these versatile machines can profitably fit into your production picture, call in your Warner & Swasey Field Representative, today.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880



Sand . . . heavy rain . . . extreme heat . . .

Nothing stops These Westinghouse Life-Line A Motors

dependably driving oil well pumps in Odessa, Texas district of The Atlantic Refining Company, 24 hours per day, 7 days a week!

"Here's an application," says A. P. Johnston, production engineer at The Atlantic Refining Company, "where we must have continuous motor operation . . . sometimes for as long as 18 months . . . with virtually no maintenance or repair. Many of our pumping stations are remotely located, automatic and unmanned. Any stoppage or motor failure would result in the loss of several hundred barrels of oil. Motor repairs in the field are prohibitive in cost. We must have *complete* motor reliability and that's exactly what we get from our Westinghouse Life-Line® "A" motors."

How about you? Got a really tough motor application which you can't afford to pamper? Then ask your Westinghouse sales engineer to show you how the dependable Life-Line "A" pays for itself through reduced maintenance and repair. Or write to Westinghouse Electric Corp., P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania. J-22055

YOU CAN BE SURE...IF IT'S Westinghouse

On this pumping unit, the 15-hp Life-Line "A" motor operates in an atmosphere of damaging dust, sand and moisture. Despite continuous, heavy-duty service, motor has never suffered any overheating since first installed. Prelubricated bearings of the Life-Line "A" eliminate periodic greasing . . . keep lubricant in . . . dirt out.

True story of a shotgun wedding:

Due to a production miracle performed in their plant, a famous manufacturer of shotguns (name on request) is now completely wedded to

LAPOINTE -BROACHING

The story begins in a plant where six men, operating six machines, devoted the entire work-week to the production of hammers, triggers and catches required for the week's output of shotguns.

The story ends with one man, operating a Lapointe Double-Ram Vertical Broaching Machine, producing all the required parts *in less than one day!*

Through Lapointe-Broaching, now all parts are perfect parts, where formerly 25% was scrap or had to be reworked! With quality up, and production costs substantially down, the manufacturer gained an impressive lead on his competition by his ability to reduce the price of the finished product.

This is a true story, where conversion to Lapointe-Broaching paid off . . . BIG! Perhaps something equally important can take place in your plant. A qualified Lapointe Field Engineer will gladly discuss some of your machining operations with you — *invite him in!*

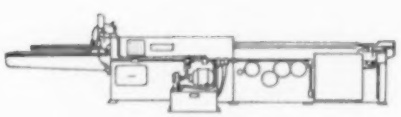
Send today for Lapointe **Bulletin DRV-1**
It describes the machine illustrated here.

THE LAPOINTE MACHINE TOOL COMPANY

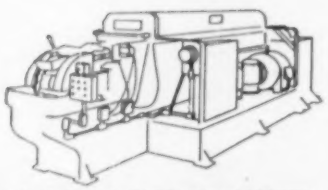
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

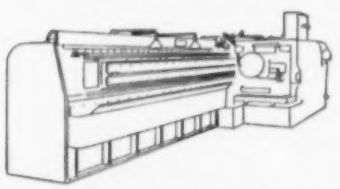
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC

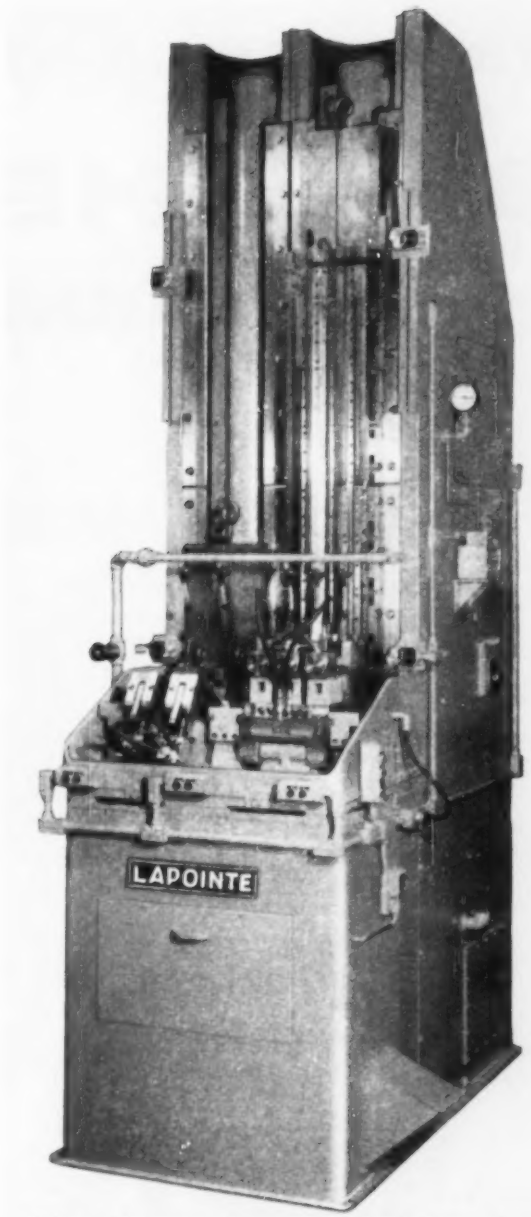
HAMMER formerly required 8 milling operations and 3 burring operations
Now LAPOINTE-BROACHED at rate of **280** parts per hour

TRIGGER formerly required 4 milling operations
Now LAPOINTE-BROACHED at rate of **280** parts per hour

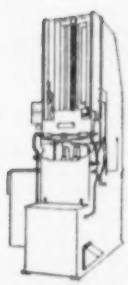
CATCH formerly required 3 milling operations and 3 burring operations
Now LAPOINTE-BROACHED at rate of **280** parts per hour

total 840 parts per hour

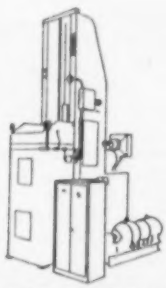
all Lapointe-Broached **on one machine with one operator**



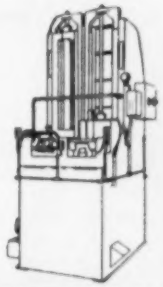
Intricate shotgun parts are automatically clamped — hydraulically — in the fixture of this Lapointe Double Ram Vertical Broaching Machine.



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

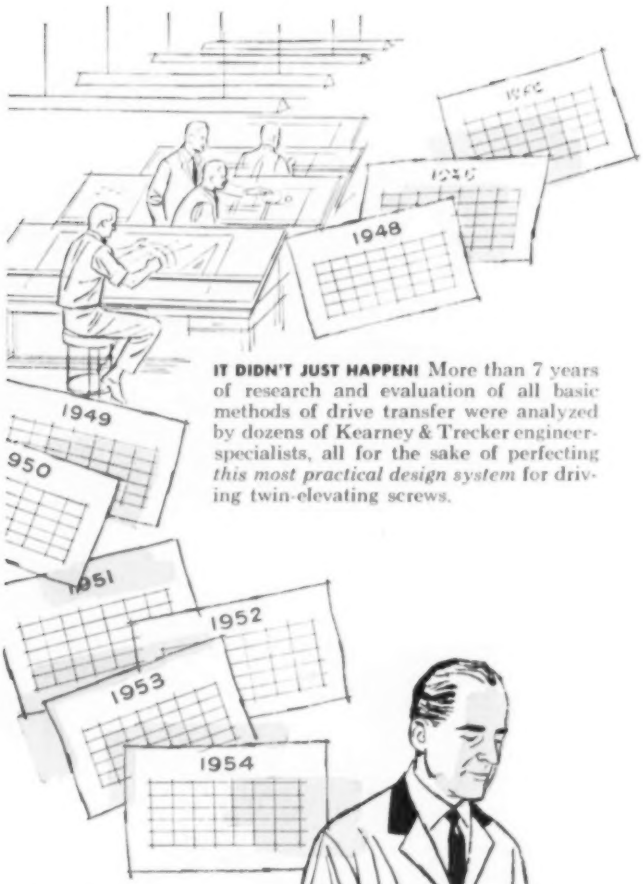
BROACHING

Behind the scenes

ANOTHER FIRST

from KEARNEY & TRECKER

It's the ultimate in drive transfer methods for maintaining perfect synchronization of exclusive twin-elevating screws on TF Series knee-type milling machines. Pace-making design offers maximum accuracy far beyond previous heavy duty knee-type designs.



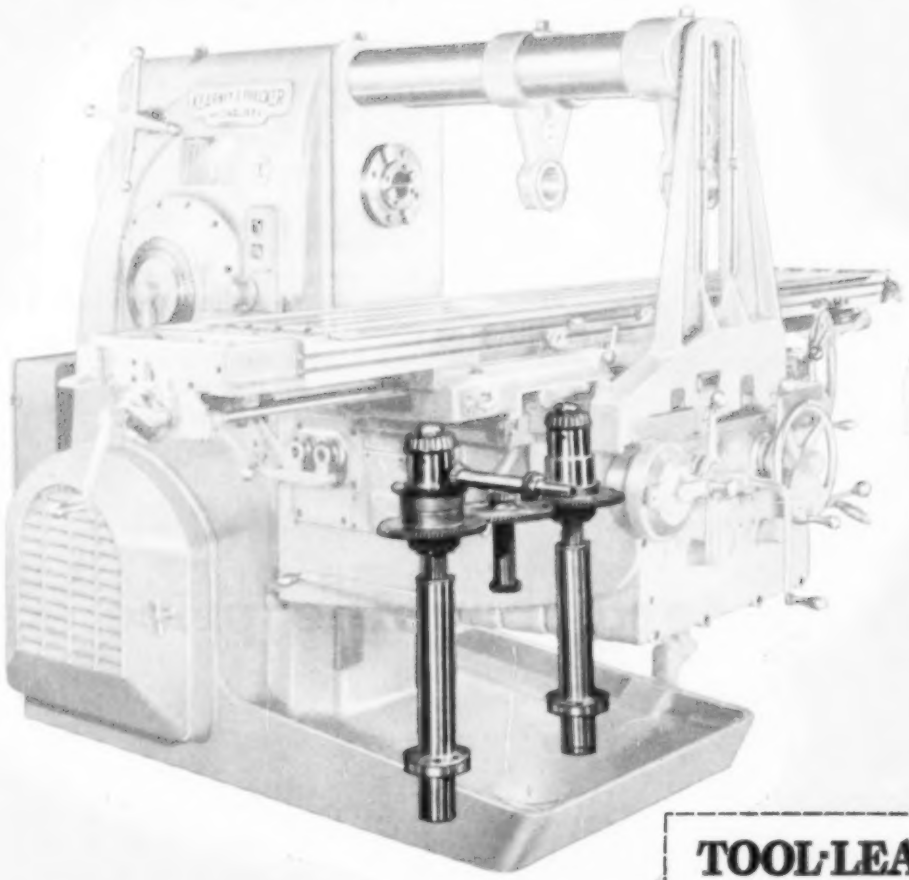
IT DIDN'T JUST HAPPEN! More than 7 years of research and evaluation of all basic methods of drive transfer were analyzed by dozens of Kearney & Trecker engineer-specialists, all for the sake of perfecting *this most practical design system* for driving twin-elevating screws.

ONE BY ONE, VARIOUS DRIVE METHODS WERE ELIMINATED!

Helical, bevel, herringbone gears, worm and wheel and chain drives... all were rejected for one or more reasons . . . cost, complicated design and resulting maintenance difficulties, lack of consistent accuracy, excess wear and heat generation problems.

FINALLY, SIMPLE, COMPACT, SPUR PLATE GEAR DRIVE PROVES BEST! Optimum 3-gear system with wide center distance between screws gives maximum support to knee. Large gears allow more teeth... reduce error. Screws rotate in same direction, make it possible to match them accurately... no differential error between screws.

# of a very important development



Hundreds of users know...
TWIN ELEVATING SCREWS REDUCE DEFLECTION AND INCREASE ACCURACY 3 TIMES...
over heavy duty single screw design milling machines.

FULL FACTS FREE!
Write for Bulletin TF-57 on your letterhead.

KEARNEY & TRECKER CORP.
6786 W. National Ave. • Milwaukee 14, Wisconsin

TOOL-LEASE

Should you desire, you can conserve capital, reduce obsolescence using Kearney & Trecker Tool Lease program. It applies to all TF Series milling machines with exclusive twin-screw knee support as well as other Kearney & Trecker machine tools.

Write for complete Tool Lease program.

KEARNEY & TRECKER MILWAUKEE ®

Designers and Builders of Precision and Production Machine Tools Since 1898

for management

The experienced investor examines his portfolio of securities frequently, buying or selling to adjust to changing conditions and improve his earnings.

The metalworking executive is an investor, too, responsible for constantly checking his investment in machine tools. He knows that shrinking returns on outmoded equipment can squeeze him right out of competition.

If you are currently surveying your "portfolio" of machine tools, it will pay you to consider an investment in Avey production equipment, which in many cases has earned its acquisition price in less than two years. Avey Division, The Motch & Merryweather Machinery Co., Box 625, Cincinnati 1, Ohio

Standard machine price equals

for production men

The flexibility of "standard" equipment and the production of "special" are combined in this 62-foot Avey Line-O-Dex machine.

Operations on the jet engine diffuser case include drilling, countersinking, reaming, and lead screw tapping.

One fixture moves both linearly and radially to index the part. Add a second fixture and you double production.

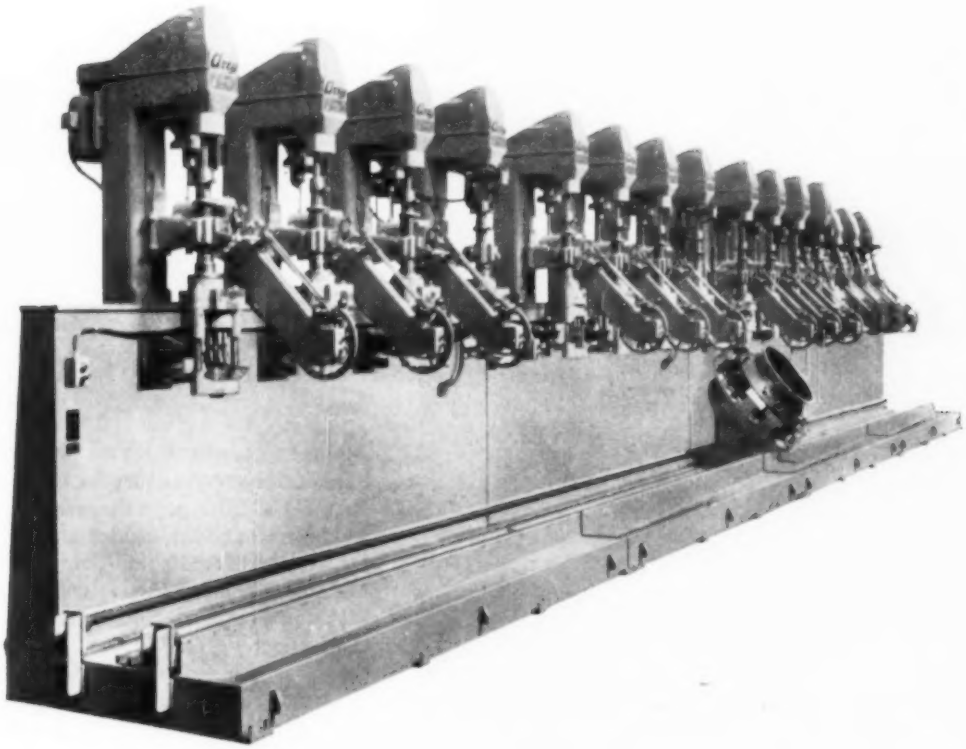
Standard drilling columns are arranged with multiple spindle drill heads which have power feed, four rates of feed, adjustable speeds, and additional head and quill travel to permit easy changeover to a new design.

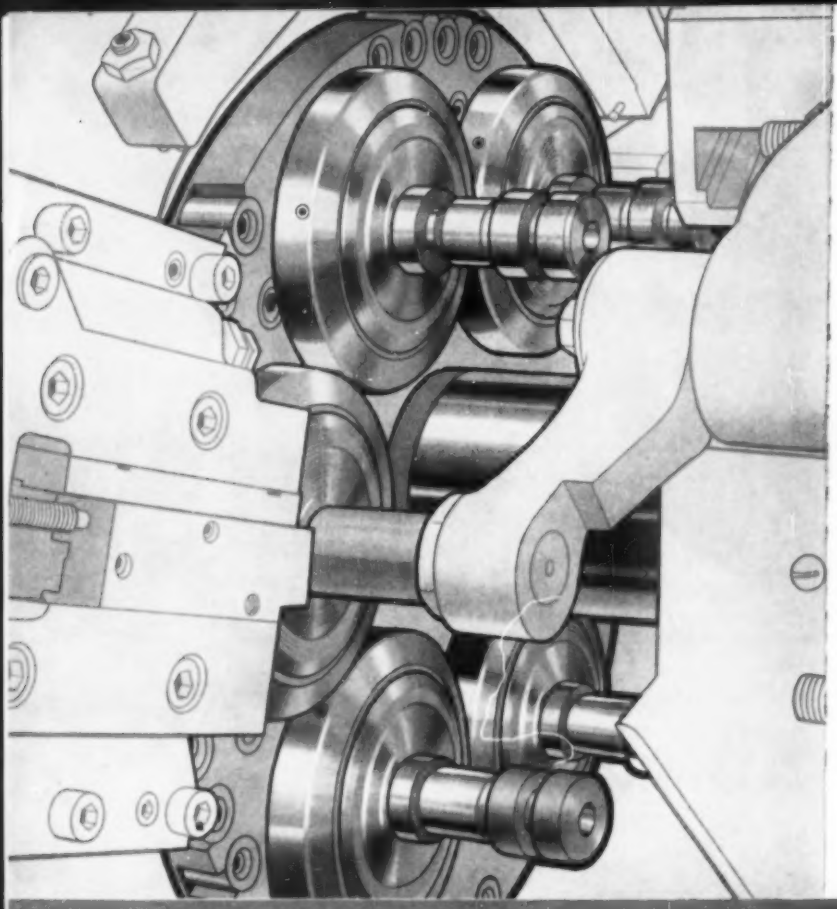
Transfer mechanism is supported by the base. Another example of Avey's customer-oriented engineering.

Avey

drilling, tapping, production machines

special machine profit

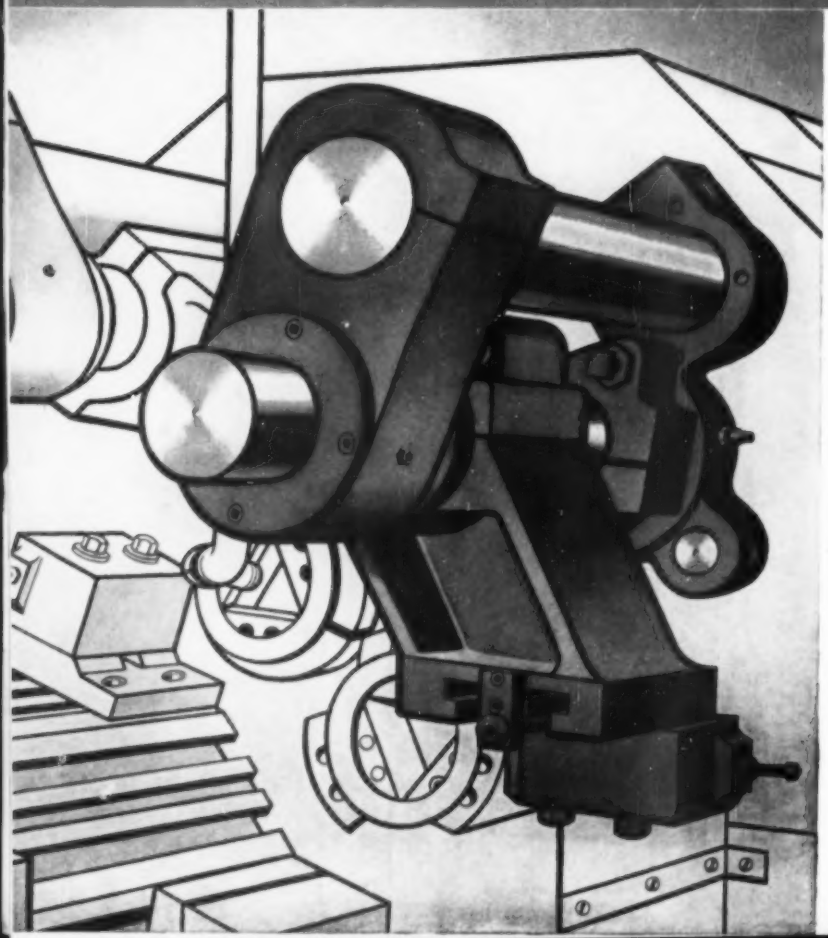




Look at New Britain's

new automatic bar machines

The widest range of spindle speeds among machines of comparable capacity and accuracy.



Look at New Britain's

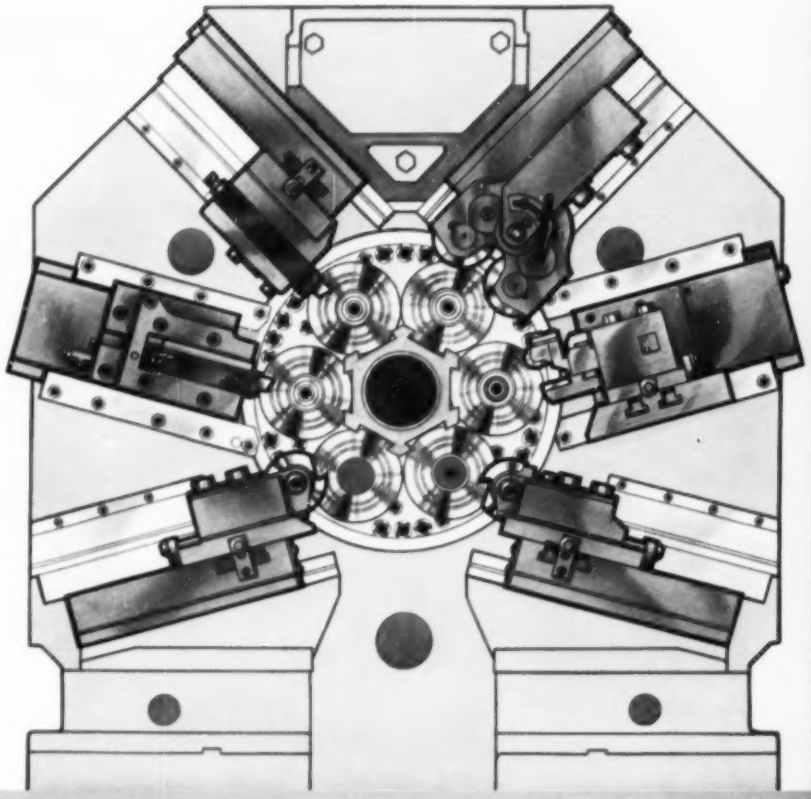
exclusive chucker arms

All the ruggedness of a cross slide, but with two-way motion for cutting O.D.'s, I.D.'s, tapers and radii and for recess boring, in addition to facing cuts. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

Look at New Britain's

new cross slide arrangement

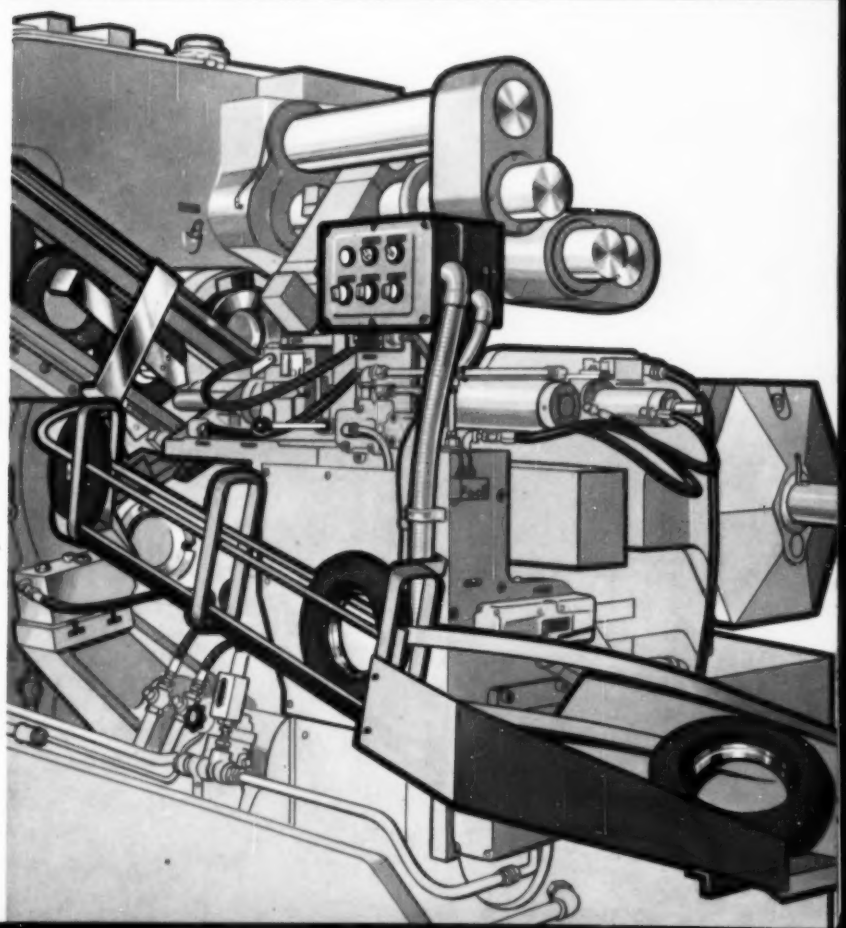
Independent radial cross slides in *all* positions, providing maximum clearance for more cross slide operations.

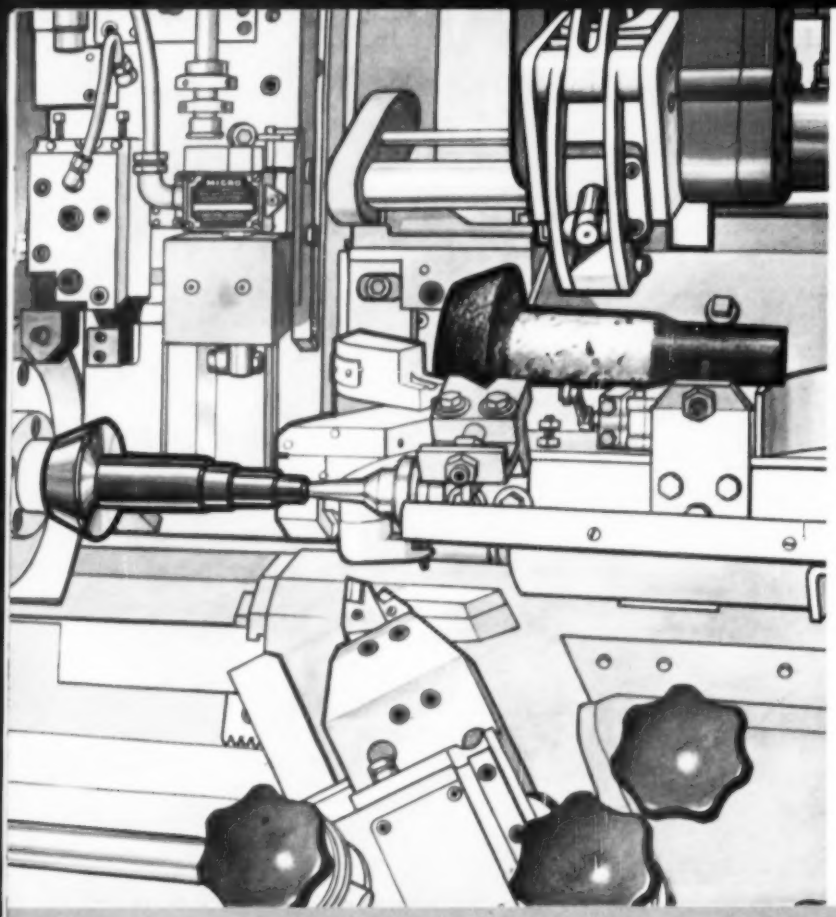


Look at New Britain's

open-end chucker design

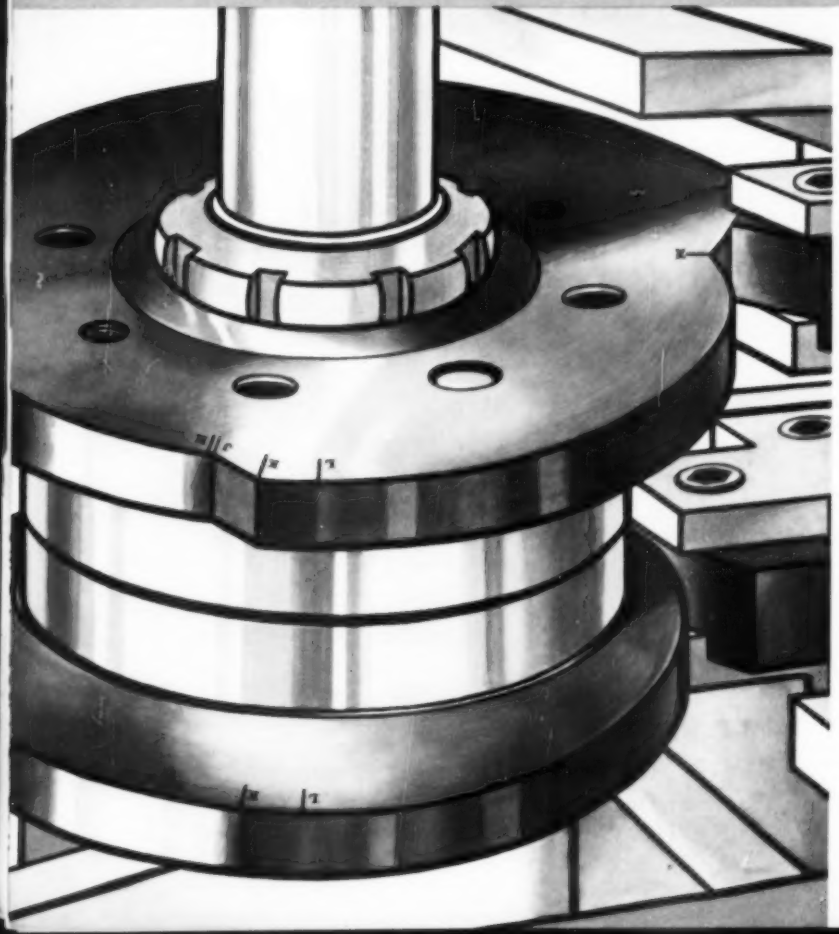
Greater accessibility for all applications and particularly well adapted to automatic handling of pieces. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.





Look at
Automatic Loading on
New Britain +GF+

This basic optional feature can make money for you whether you are working with forgings, bar slugs, or bar stock.

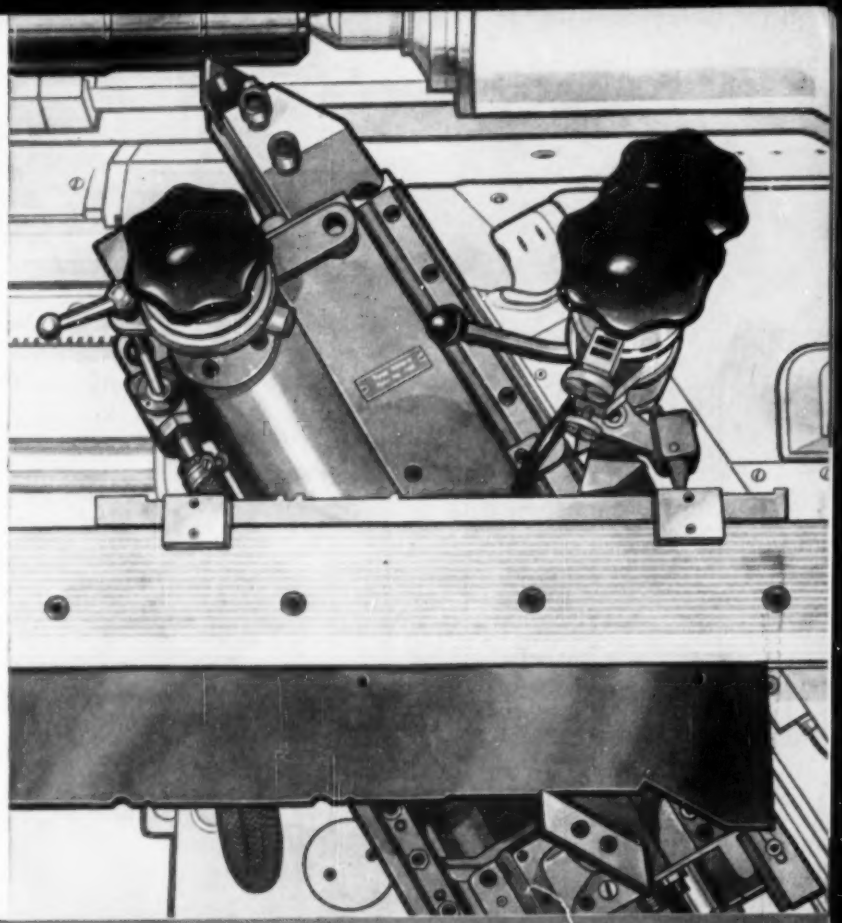


Look at New Britain's
cam-controlled boring machine

When you are working to tenths there is no substitute for the positive tool control that only precision cams provide. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

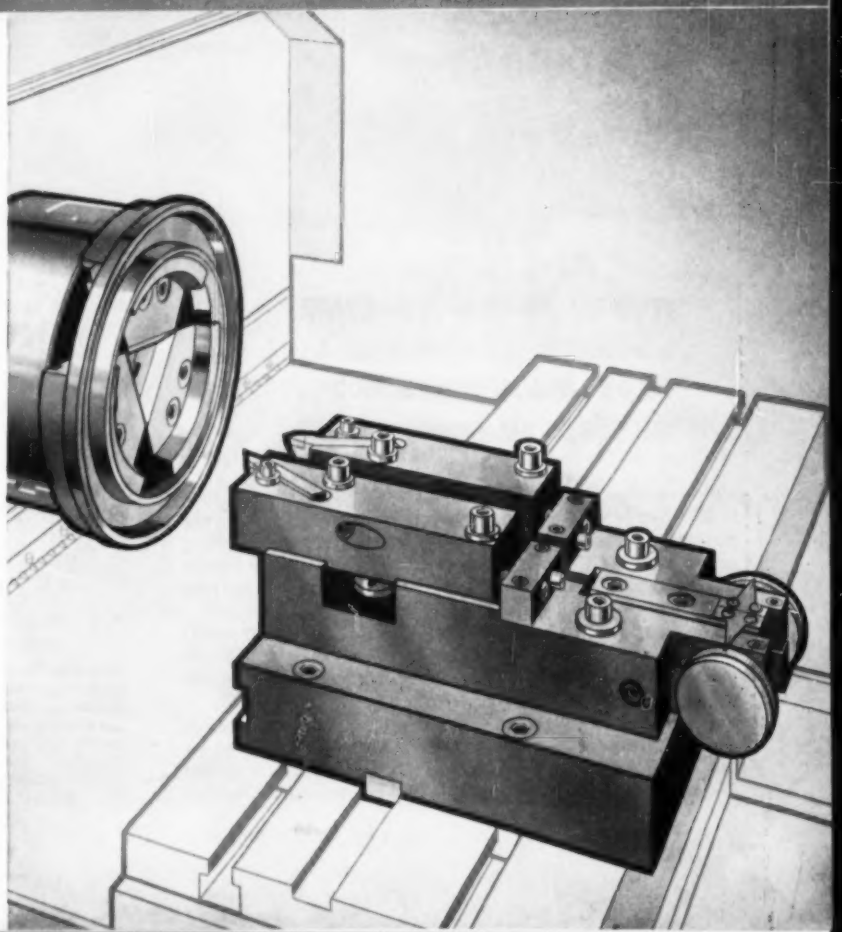
Look at
Single Point Tooling on
New Britain +GF+

Outproduces gang tooling setups by reducing tool change time practically to zero, and by cutting at maximum speeds and feeds for tool efficiency.

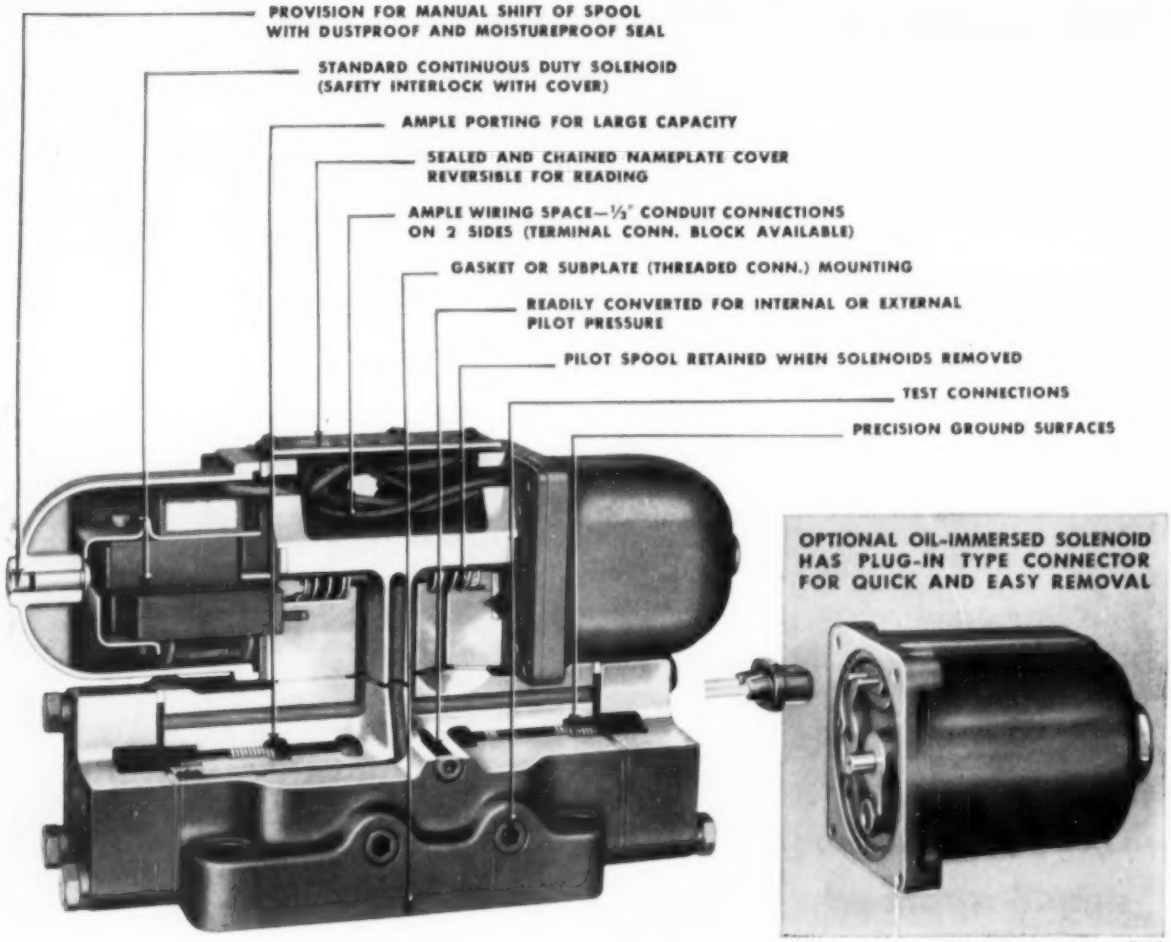


Look at New Britain's
simple approach to problem pieces

Low cost per piece is inherent in New Britain Precision Boring Machines because of their simplicity, versatility, speed, repetitive accuracy and inexpensive tooling. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.



Only VICKERS® DIRECTIONAL VALVES Have *All* These Features


PROVISION FOR MANUAL SHIFT OF SPOOL WITH DUSTPROOF AND MOISTUREPROOF SEAL
STANDARD CONTINUOUS DUTY SOLENOID (SAFETY INTERLOCK WITH COVER)
AMPLE PORTING FOR LARGE CAPACITY
SEALED AND CHAINED NAMEPLATE COVER REVERSIBLE FOR READING
AMPLE WIRING SPACE—½" CONDUIT CONNECTIONS ON 2 SIDES (TERMINAL CONN. BLOCK AVAILABLE)
GASKET OR SUBPLATE (THREADED CONN.) MOUNTING
READILY CONVERTED FOR INTERNAL OR EXTERNAL PILOT PRESSURE
PILOT SPOOL RETAINED WHEN SOLENOIDS REMOVED
TEST CONNECTIONS
PRECISION GROUND SURFACES
OPTIONAL OIL-IMMERSED SOLENOID HAS PLUG-IN TYPE CONNECTOR FOR QUICK AND EASY REMOVAL
7897

REDUCED DOWN-TIME
LONGER SOLENOID LIFE
LESS MAINTENANCE
EASIER INSTALLATION

Vickers hydraulic 2- and 4-way valves provide the optimum in directional control. They are compact, versatile, and are designed for heavy duty, continuous and rapid cycling operation on all types of industrial machinery. More than a decade of application experience and years of research and development back all the valves' features.

Seven spool types satisfy a wide variety of circuit needs and operate at pressures to 3000 psi. Optional oil-immersed solenoids operate cooler, increasing service life 20 to 30 times.

Installation is simplified with ease of wiring and a minimum of piping. The valves are available for gasket or sub-plate mounting. Mounting position is unrestricted except in "no-spring" models. The optional oil-immersed solenoid has a plug-in type connector and is available in all standard voltages. Field modification of existing units can be made to incorporate heavy-duty, oil-immersed solenoids.

The valves conform to JIC Standards and are available in ⅛" and ¼" direct solenoid operated models . . . ¾", 1¼", 2", and 3" solenoid controlled pilot operated models. These valves cover the flow range from 1.25 gpm to 320 gpm.

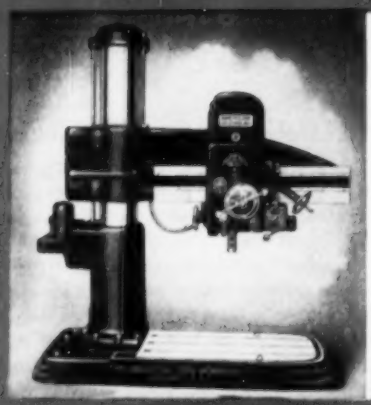
For further information, write for Installation Drawing I-182412.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
Machinery Hydraulics Division
ADMINISTRATIVE and ENGINEERING CENTER
Department 1410 • Detroit 32, Michigan

Application Engineering Offices: ATLANTA • CHICAGO • CINCINNATI CLEVELAND • DETROIT • GRAND RAPIDS • HOUSTON • LOS ANGELES AREA (El Segundo) • MINNEAPOLIS • NEW YORK AREA (Springfield, N.J.) • PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • PORTLAND, ORE. • ROCHESTER ROCKFORD • SAN FRANCISCO AREA (Berkeley) • SEATTLE • ST. LOUIS • TULSA WORCESTER
FACTORIES ALSO IN AUSTRALIA, ENGLAND AND GERMANY
IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto and Montreal

?

Are you really putting your small radial drills to work...OR... are they just drilling machines



If they are "AMERICAN" Hole Wizards they are DRILLING...TAPPING and BORING MACHINES

...not just radial drills!

To further improve their boring qualities the new "AMERICAN" 9 inch and 11 inch column Hole Wizards now may be equipped with a FINE FEED BORING ATTACHMENT.

This attachment, furnished in addition to the standard feeding mechanism, merely by the flip of a lever reduces the standard feed range 75 per cent.

The fine boring feeds thus provided are the answer to precision boring on radial drills. Many tool and die shops are already using them for high precision, fine finish boring of jigs and fixtures.

And don't overlook the advantages of the Hole Wizard's Helical Gear—Lo-Hung Spindle Drive —NITRIDED SPINDLE AND SLEEVE—TIMKEN MOUNTED WITH OUTSIDE ADJUSTMENT FOR SPINDLE BEARINGS.

These exclusive "AMERICAN" features permit putting your radial drills to work at a profit.

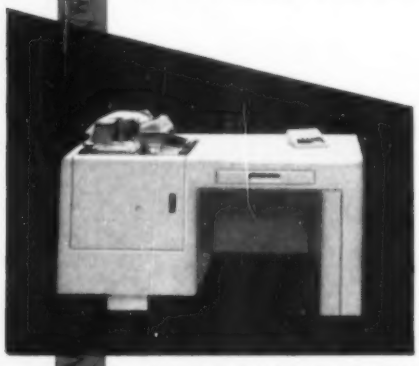
- ***Ask for bulletin No. 325 and get all the facts.***

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U.S.A.

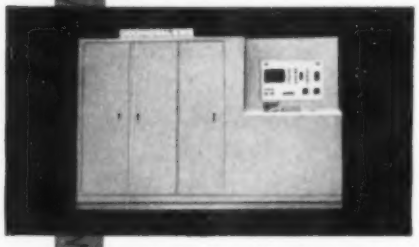
LATHES AND RADIAL DRILLS

Here are the facts about

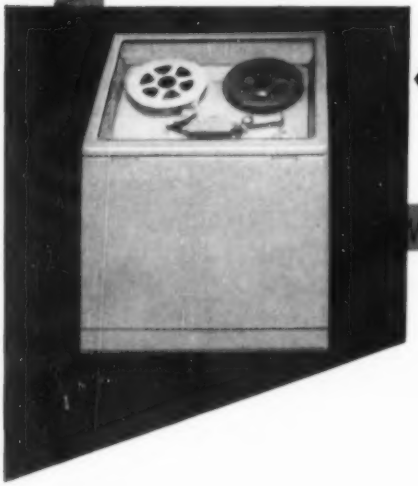
How Giddings & Lewis NUMERICORD system of machine tool automation boosts production, increases accuracy on a wide range of machining operations



Pre-calculated data, tooling studies and feed rates in decimal form are accepted by preparation desk for punching paper tape.

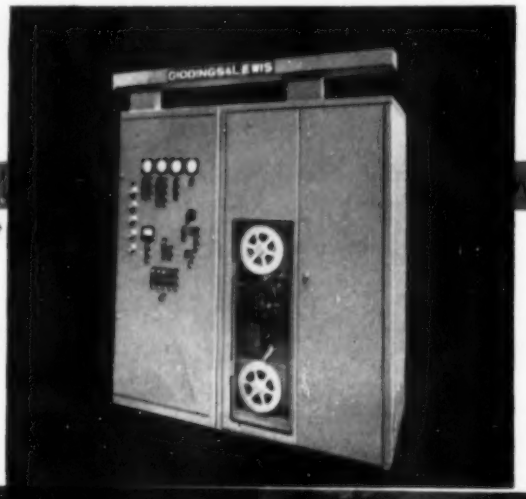


Computing director converts decimal numerical data on paper tape into time-coordinated continuous electric signals . . . also accepts output data from standard computor program.



Magnetic tape recorder impresses all electrical signals from director on appropriate channels of a master magnetic tape.

Tape playback and machine control unit reads magnetic tape to control all axes and auxiliary functions of the machine tool automatically.



1 Is this type control system ready for production use?

Definitely! Giddings & Lewis machines have operated under NUMERICORD tape control for almost three years. They have proved that complicated, short-run jobs — some unmachinable by other methods — can be turned out with higher accuracies at greater production rates — in less factory space and with less time from drawing to finished part — with less total equipment. In fact, for *any* type of machine on which work can be programmed, Giddings & Lewis is ready to supply the proved advantages of NUMERICORD system of machine tool automation.

2 What is the scope of G&L's "hi-fi" machine tool progamming?

Giddings & Lewis is a pioneer in numerical control.

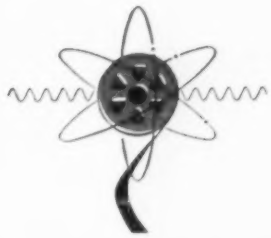
• The G&L NUMERICORD system for machine tool automation was originally developed in collaboration with scientists from the Massachusetts Institute of Technology.

• G&L will design, build and install all equipment; then fully train your personnel in the operation of complete numerical control systems including all functions — programming, data processing, tape preparation and machine control.

3 How much will NUMERICORD cost?

While far more versatile, NUMERICORD's first cost is not as high as machines with one-to-one tracer control. Actually, of course, the correct basis for judging the economics of such an investment is *cost per machined piece*. When correctly applied, NUMERICORD can reduce this figure spectacularly by minimizing set-up time, increasing machine capacities, running equipment continuously, repeating without error, improving tool life, and reducing rejects caused by operator's error. It has been estimated that production capacity with numerical control is three times that of current methods in one-half the space. And to hold your investment down, G&L will make magnetic tapes for you — you need purchase our machine-control play back and the necessary machine tool or tools.

numerical control!



4 Are machines *now* available to make the most of NUMERICORD?

Yes. The following Giddings & Lewis machine tools can be programmed for discrete position or path control: Horizontal Boring, Drilling and Milling machines (table, planer and floor types); planer-millers in various multiple cutting head arrangements; skin and spar milling equipment with single and multiple head arrangements; VARIAX (variable axis control contour milling machines); vertical boring mills; Kaukauna vertical turret lathes; Cincinnati Bickford radial drilling equipment using automatic table positioning; Kaukauna horizontal and universal boring, drilling and tapping machines.

Consider the VARIAX contour milling machine, shown below. Coupled with NUMERICORD, this is the only machine tool on the market today that provides *five* simultaneously and automatically controlled axis motions.

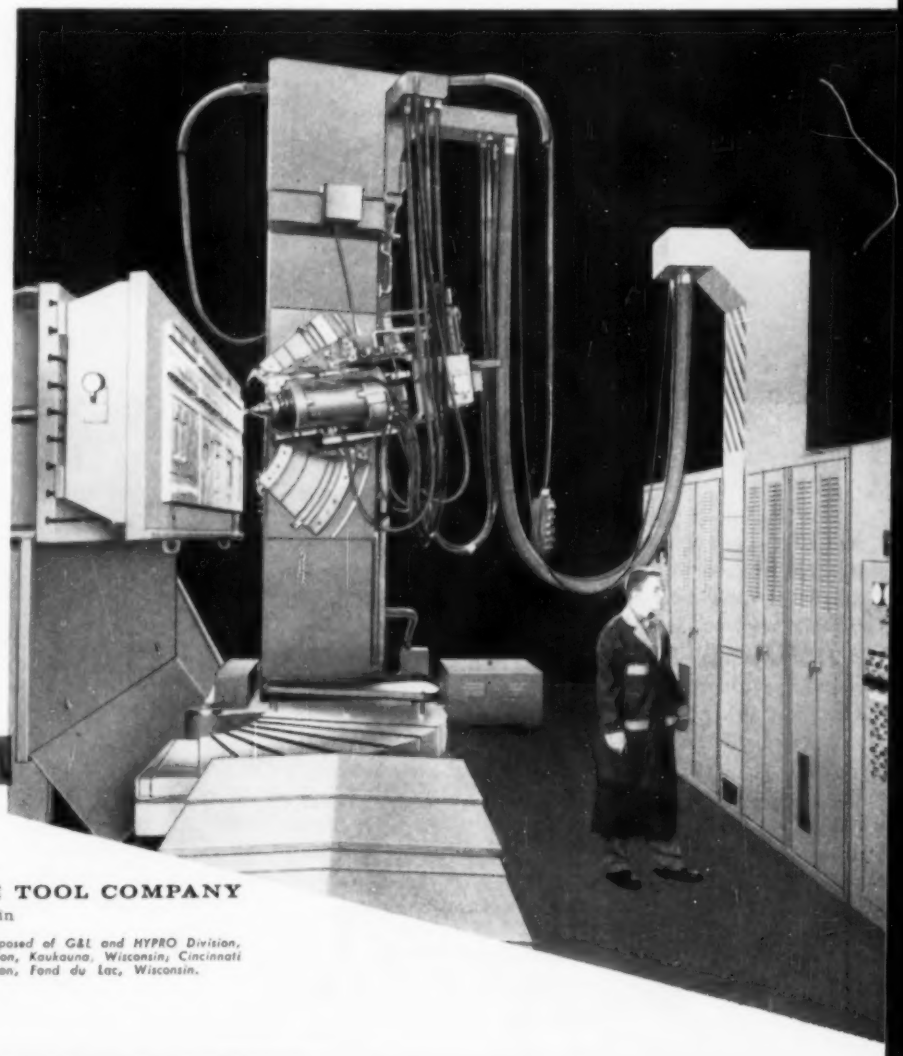
And through their Davis Boring Tool Division, G&L can tool all machines for any program.

•

Don't be confused by all the current publicity on numerical control. Come to G&L for straight-forward answers to any questions. At no obligation to you, G&L will evaluate the feasibility of this equipment for your operation and recommend programming procedure. G&L also offers complete programming service for G&L tools and their associated numerical control systems. And for a preliminary idea of how NUMERICORD works on production machines, ask your distributor for a private showing of color-sound moving pictures featuring present applications.

•

VARIAX contour milling machine designed for high speed contour milling of aircraft structural components and other similarly complex parts in a variety of configurations. Machine movements and functions are fully automated with NUMERICORD for maximum operating efficiency.



GIDDINGS & LEWIS MACHINE TOOL COMPANY

Fond du Lac, Wisconsin

Builders of the world's most modern machine tools and composed of G&L and HYPRO Division, Fond du Lac, Wisconsin, Kaukauna Machine & Foundry Division, Kaukauna, Wisconsin; Cincinnati Bickford Division, Cincinnati 9, Ohio; Davis Boring Tool Division, Fond du Lac, Wisconsin.

Now SIMONDS Offers You

a Fine Grained, Silicon Killed

LOW CARBON

Flat Ground Steel

This new line is in ADDITION to

SIMONDS FLAT GROUND DIE STEEL

High Grade Alloy Tool Steel
(Oil Hardening — Air Hardening)

Here's a fine-grained, forging quality, silicon-killed steel that opens up the way to important savings on items like jigs, fixtures, patterns, stripper plates, punch pads, die plates, die-blocking shims . . . *and parts that don't require heat treatment or in some instances, just case-hardening.*

This new line of low-cost, LOW-CARBON Flat Ground Steel rounds out the present Simonds line of Oil Hardening and Air Hardening Die Steel. What's more, it has equally fine finish . . . and is made to the same close tolerances, with excellent welding quality and machineability.

Simonds LOW-CARBON Flat Ground Steel is furnished in a wide range of flats from 1/16" to 1½" thick and 5/8" to 16" wide, and in squares from 3/8" to 2⅞". All sizes come in standard, ready-to-use 24" lengths, individually packaged. Stock sizes are ready now . . . special sizes on order. *Get full details from your Simonds Distributor today.*

TYPICAL CHEMICAL ANALYSIS

C. .18	Mn. .50
Si. .20	Phos. & Sul. .04

Heat Treatment By Case Hardening Only

SIMONDS SAW AND STEEL CO.
FITCHBURG, MASS.

Factory Branches in Boston, Chicago, Shreveport, La., San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Heller Tool Co., Newcomerstown, Ohio
Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

In the most forward position

...Hannifin valves

Our "NE" valve—one of several Hannifin 4-way directional air control valves. Ask your Hannifin man when to use it.

Persistent research is bringing Hannifin valves to the most forward position in the field of pneumatic controls. These valves are opening up new areas of progress for sequential automatic production.

The Hannifin valves you buy today incorporate the very latest results of never-ending testing and development. Versatility of application and dependability of operation are winning them their position of leadership.

See your Hannifin man. Find out for yourself why Hannifin air control valves are so rapidly becoming first choice for automatic operation.

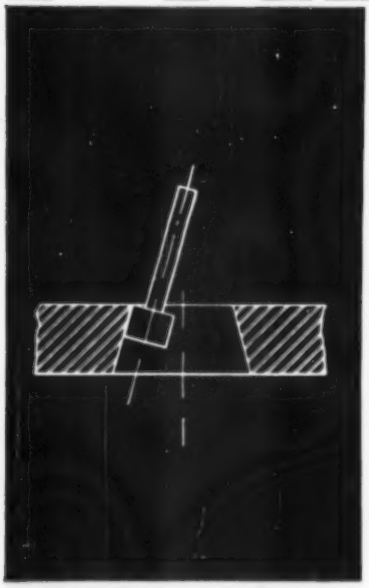
AIR CONTROL

HANNIFIN

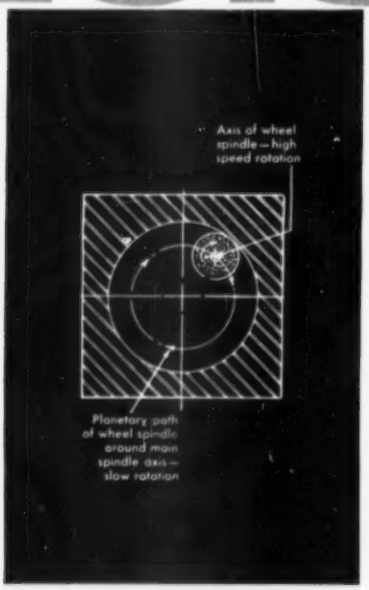
VALVES

For this complete catalog showing all the Hannifin directional air control valves, write to Hannifin Company, 517 South Wolf Road, Des Plaines, Illinois.

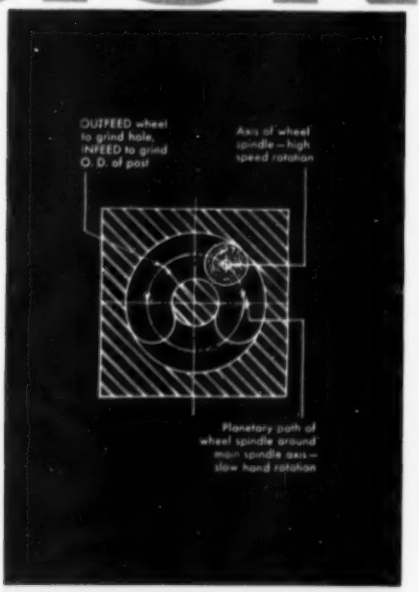
PRECISION



TAPER
(*and straight*)



PLANETARY


OUTFEED wheel to grind hole
INFEED to grind O. D. of post
Axis of wheel spindle—high speed rotation
Planetary path of wheel spindle around main spindle axis—slow hand rotation

CONTOUR
(*with head*)

MOORE-FOSDICK JIG GRINDER

A new degree of speed, convenience and capacity is brought to precision grinding in the Moore-Fosdick Jig Grinders. This combination of the unique Moore Grinding Head with Fosdick Jig Borer Tables makes possible advantages never before available.

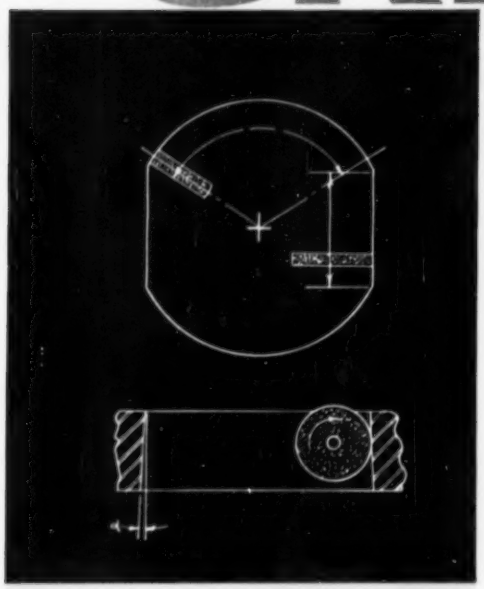
All standard jig grinding operations can speedily and conveniently be accomplished on the Moore-Fosdick, in addition to many which were formerly known as "trick" operations. Both straight and tapered holes can be located and ground, as well as contours consisting of radii and tangents or chordal surfaces.

The angular and indexing device built into the main spindle and the slot grinding attachment permit quick, accurate grinding of any contour, regular or irregular. Setting work on a rotary table is unnecessary except for angular surfaces. Chop grinding removes stock rapidly and makes contour grinding even faster.

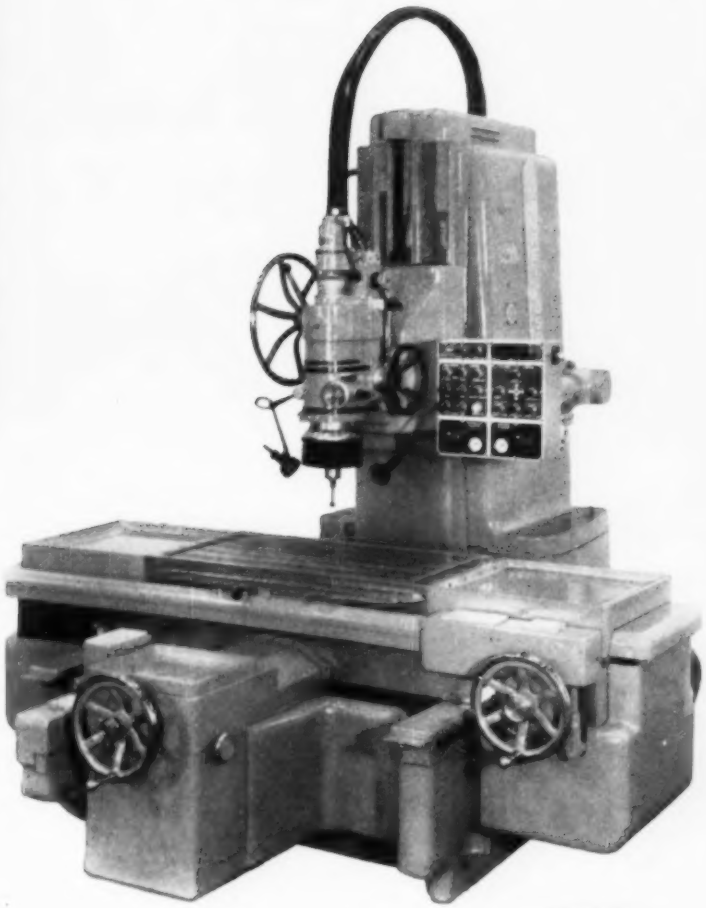
An infinite range of grinding speeds—from 12,000 to 60,000 rpm—allows accurate control

GRINDING

OF LARGE WORK



CONTOUR
(with slot grinder)



of grinding and stock removal. Long-lasting precision is assured by quality construction and by many features that provide dimensional stability, including spindle-housing heat control.

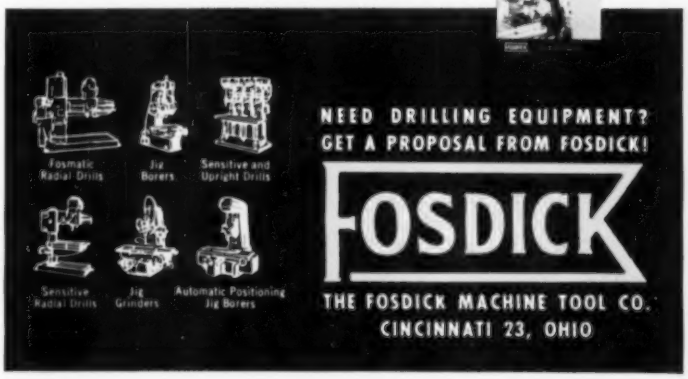
The machine may be ordered in any one of three models, one of which comes in two sizes. *All will give accuracy of ± .0001".*

Measuring is accomplished with measuring rods and inside micrometers or with Direct Dimension Measuring, where dimensions are simply set from blueprint to direct reading drum dials. Automatic positioning is also available.

Numerical control by punched tape or cards is available.

For a complete description of the various grinding operations, measuring systems and other machine features—many exclusive with Moore-Fosdick, write today for your jig grinder catalog.

Ask for Bulletin JG-A.



What is the BIGGEST

Here's LeBlond rigidity in action at Alliance Tool & Die Corp., Rochester, N. Y. The part is a 6500 lb. molybdenum steel compressor wheel. 32 micro finish and ± .001", minus .000" critical tolerance on bore, recess and hub!

workpiece your lathes can turn?

Probably your lathes will swing a 32″ piece. Or 40″. But what happens when that occasional 50″ or 60″ job comes along? Chances are you have to say, "We can't handle it. After all, how can you justify a big swing lathe, just for a few big jobs a year?"

Today there *is* a practical and economical solution to this odd-size work problem. LeBlond Sliding Bed Gap Lathes.

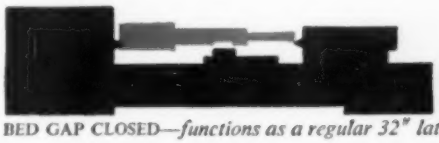
Our 32″/60″ Heavy Duty will accommodate work up to 60″ diameter! Basically this is a 32″ lathe. But it has an extendible bed (an upper bed that slides on a lower bed). Slide it to the right, and a gap opens. Now, you have a full 60″ swing! Also, for extra long work, there is 50% greater center distance. And the rest of the time you have a regular 32″ heavy duty lathe for a wide variety of work.

3 lathes in one—at the cost of a lathe and a half!

Here's an example of how this extra capacity pays off. Alliance Tool and Die Corp., Rochester, N. Y. are specialists in unusual machining problems, like precision molds—and the bulky compressor wheel, shown here. How did they turn it before? They didn't. The part was too big. Now, with their 32″/60″ LeBlond (recommended by Macaulay Machinery Co., Rochester, N. Y.,) they take jobs like this right in stride. Actually, this particular order was made possible by this lathe.

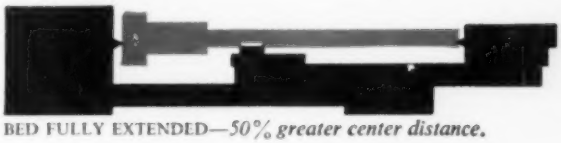
If you do job shop work, you can consider this lathe a business-getter. If you're doing your own maintenance, it gives you the capacity to do virtually all your own turning work. LeBlond Sliding Bed Gap Lathes are available in 4 sizes—16″/38″, 25″/50″ and 32″/60″ (shown) Heavy Duties and the 17″/28″ Regal. You're sure of getting the right lathe for your job when you buy LeBlond. There are 76 lathe models to choose from. Call your LeBlond Distributor or write.

Here's how the LeBlond Sliding Bed Gap Lathe gives you extra capacity for extra large work:



BED GAP CLOSED—*functions as a regular 32″ lathe.*

BED GAP OPEN—*full 60″ swing.*



BED FULLY EXTENDED—*50% greater center distance.*

. . . cut with confidence

THE R. K. LEBLOND MACHINE TOOL COMPANY
Cincinnati 8, Ohio

LeBLOND of Cincinnati

World's Largest Builder of a Complete Line of Lathes for More than 71 Years

Stainless Steel
welding information

*Follow the book and it's easy to weld Stainless

THE STAINLESS STEELS can be welded by just about any method that you use with carbon steels except for hammer or forge welding.

But you can't take just any piece of Stainless and weld it without some forethought. Each type of Stainless Steel should be treated as a very special breed of cat, and you'll save yourself a lot of headaches if you check the book before you start the job.

Which book? The best one you can get is free. It's our 130-page "Stainless Steel Fabrication Book." Write for a copy on your company letterhead to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

United States Steel photograph made at Superior Welding Co., Decatur, Illinois

United States Steel Corporation, Pittsburgh
American Steel & Wire Division, Cleveland
Columbia-Geneva Steel Division, San Francisco
National Tube Division, Pittsburgh
Tennessee Coal & Iron Division, Fairfield, Ala.
United States Steel Supply Division, Warehouse Distributors
United States Steel Export Company, New York

USS

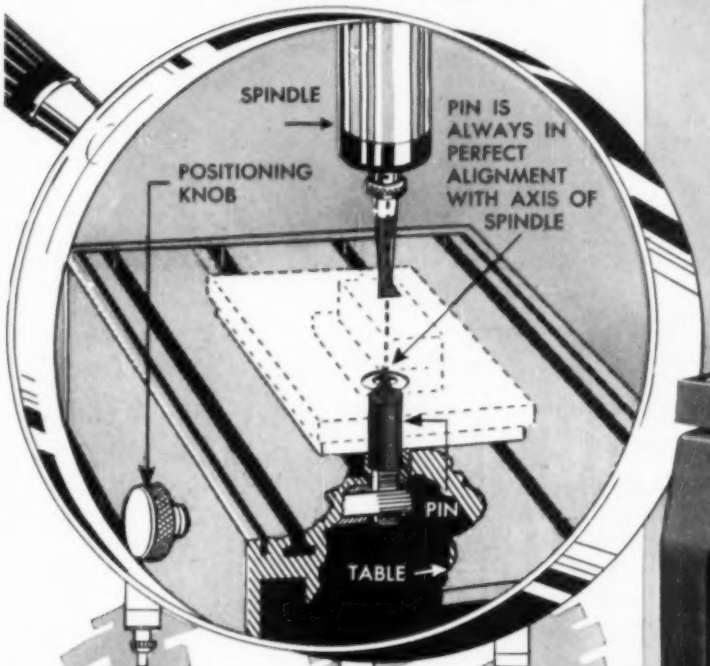
USS STAINLESS STEEL

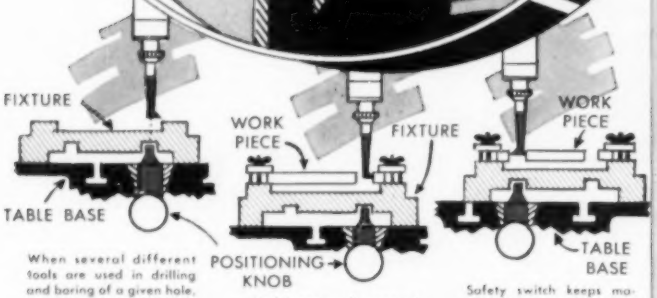
SHEETS · STRIP · PLATES · BARS · BILLETS
PIPE · TUBES · WIRE · SPECIAL SECTIONS

UNITED STATES STEEL

THE CANTON PRECISION HOLE BORER

Reproduces in quantity and at *low cost* parts that would have to be made on a jig borer





When several different tools are used in drilling and boring of a given hole, no tool changing is required until all first operations are completed.

Work is constantly exposed for easy checking and chip removal.

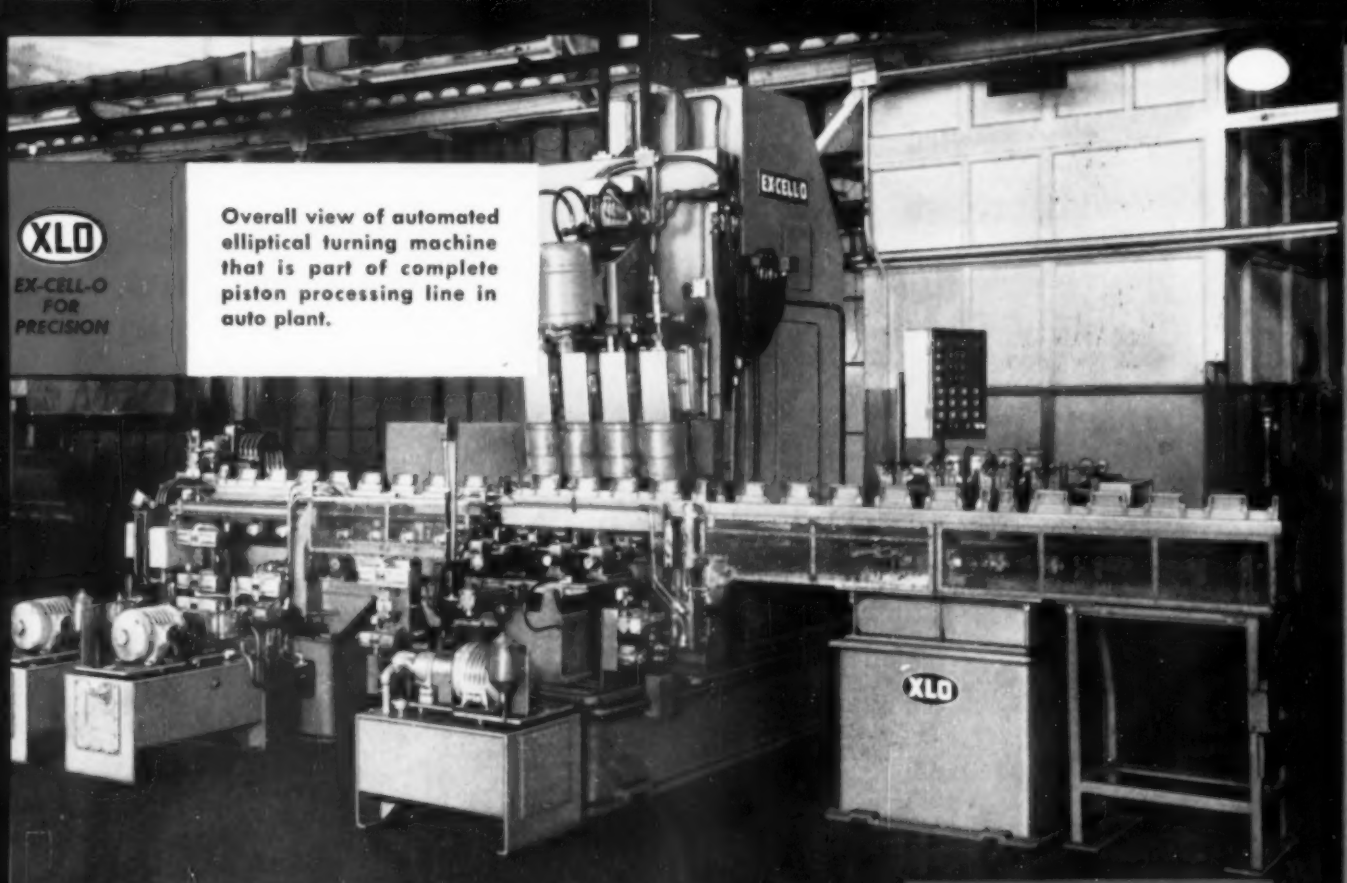
Safety switch keeps machine from operating until locating pin is positively in position.

PIN BELOW POSITIONS WORK PRECISELY AND RAPIDLY

FOR PRODUCTION CENTER-DRILLING, DRILLING, BORING

- Up to 8 times faster than other jig boring methods
- Does not require skilled machinist operator
- Guaranteed hole spacing accuracy to .0001" of true position
- Exceptional savings in design time, manufacture and maintenance of tools

THE CANTON TOOL MANUFACTURING COMPANY | EAST CANTON, OHIO



Overall view of automated elliptical turning machine that is part of complete piston processing line in auto plant.

Roughs and Finishes 250 Pistons per Hour

57-77

This automated Ex-Cell-O machine semifinish and finish turns an elliptical shape on automotive piston skirts at the net rate of 250 pieces per hour.

Pistons enter the machine from a conveyor, are radially located from their wrist pin holes and clamped on the ring land diameters. Four heads machine four piston skirts simultaneously. Air gaging follows the machining operation, after which pistons are ejected to another conveyor.

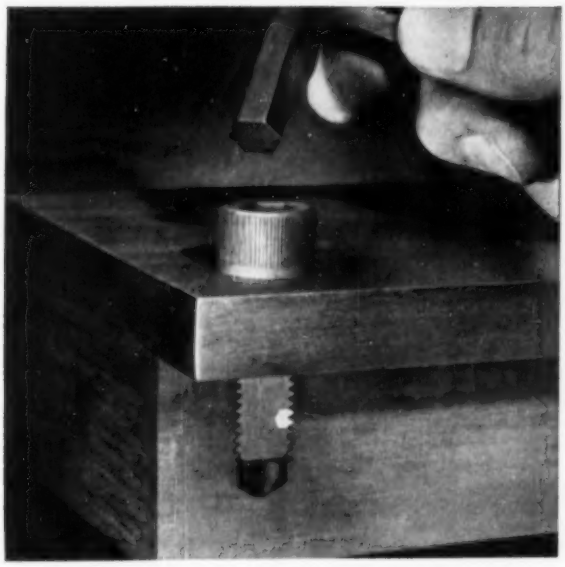
Write to Ex-Cell-O or contact your local representative for further information or a proposal.

EX-CELL-O CORPORATION *Machinery Division*
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

The ordinary fasteners securing the worm wheel to the drum shaft in this automatic screw machine loosened, causing $120 worth of damage to parts. Labor for the repair job cost $100. The ordinary fasteners were replaced with self-locking UNBRAKOS, and there has been no trouble since.

Vibration won't loosen self-locking UNBRAKO socket cap screws



HOW IT LOCKS. The tough, resilient Nylok locking pellet keys itself into the mating threads. It forces threads together and locks the screw securely—whether or not the screw is seated.

UNBRAKO socket screws with the Nylok* self-locking device eliminate fastener problems caused by vibration.

Take the drive system in the automatic screw machine illustrated above, for example. The screws originally used to secure the worm wheel to the drum shaft loosened, causing considerable damage, besides loss of production time. These have now been replaced with self-locking UNBRAKO socket head cap screws and the trouble has been eliminated.

An UNBRAKO socket screw with the Nylok self-locking device is a single unit. Just screw it into any tapped hole. Seated or not, it locks positively wherever wrenching stops. Constant vibration or endless running of a machine won't affect these self-locking UNBRAKOS. The screws will not work loose!

Write today for your copy of Form 2193, which gives catalog and technical data on the complete line of UNBRAKO socket screws with the Nylok self-locking device. Or see your local industrial distributor. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

UNBRAKO® SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA

*T.M. Reg. U.S. Pat. Off., The Nylok Corporation

On Norton diamond wheels ...this mark is

Your CERTIFIED Buying Guide

W-1836

On this Norton diamond wheel we have highlighted the mark indicating diamond concentration — in this case, 100.

What is the exact meaning of the Norton 100 mark?

It means that each Norton 100 concentration diamond wheel contains an amount of diamond in carats calculated to a formula of 72 carats per cubic inch. Wheels of 75, 50 and 25 concentration of diamond contain 75%, 50% and 25% of this 100 concentration standard, respectively.

The finished wheel contains the calculated number of carats of diamond except for the slight loss resulting from truing the diamond section to place the wheel in proper truth and condition for grinding.

With each wheel you get a certificate assuring the complete dependability of its concentration mark, signed by the President of this Company.

The Norton certified mark is your safest possible buying guide. It assures the top performance and long wheel life that you're paying for.

And remember:

Besides duplicating wheel specifications with constantly controlled accuracy, Norton was first to introduce all three types of diamond wheels — metal, resinoid and vitrified bonded . . . does all its own sizing, grading and laboratory checking of diamond bort . . . brings you a complete line, covering every diamond wheel application . . . gives you fast service from full stocks.

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for the diamond wheels you need. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

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Making better products . . . to make your products better

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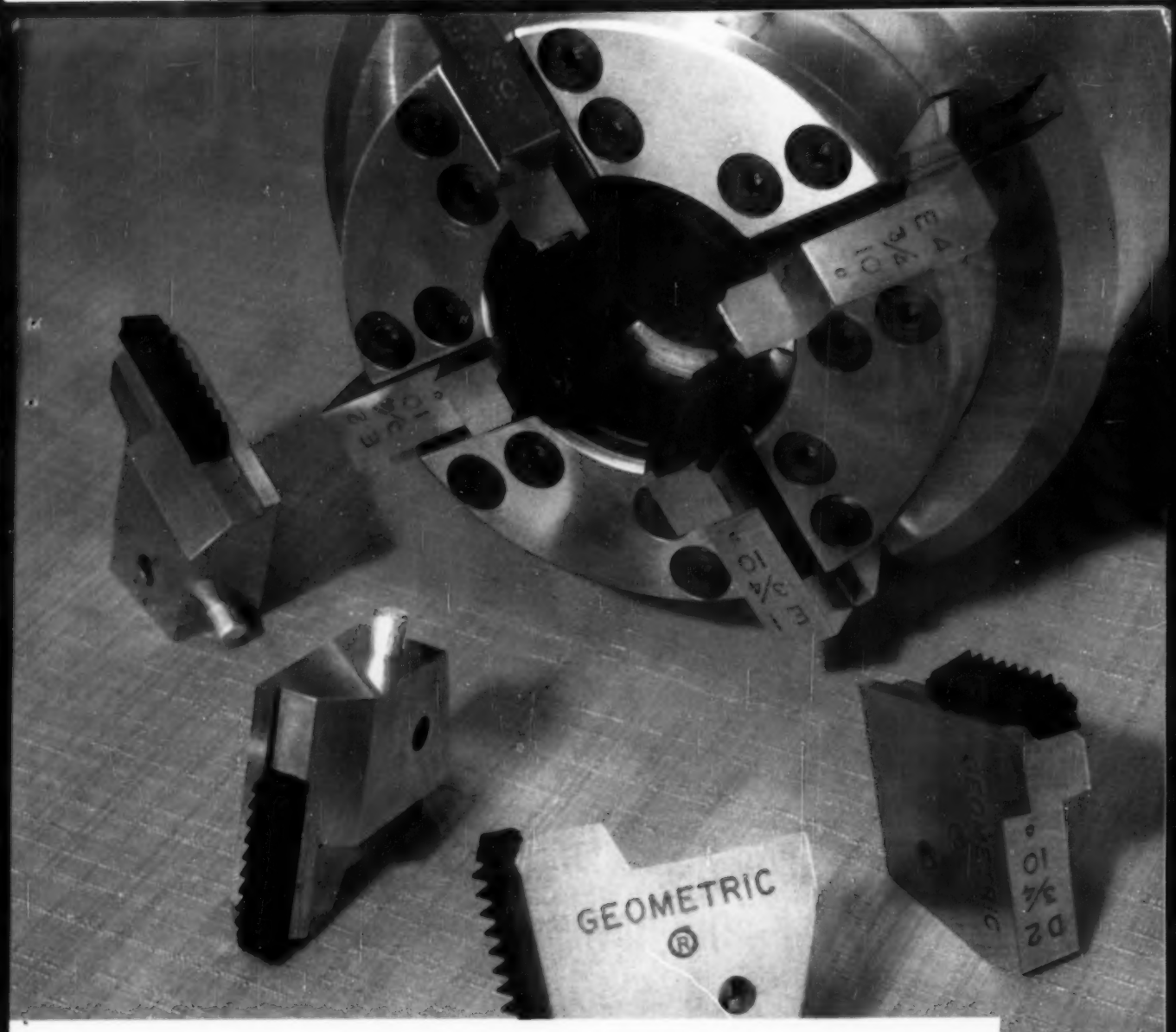

INVESTIGATE...

...CARBIDE TIPPED CHASERS...FOR GEOMETRIC TOOLS

Whether you are threading stainless or heat treated steels, abrasive materials such as iron castings, malleable iron, brass, bronze, aluminum, or plastics, hard rubber, fibre and the like,.... better look into GEOMETRIC threading tools, and chasers with Carbide Inserts.

These chasers are making impressive records on high production, long run jobs where down time must be held to an absolute minimum. Parts threaded and life between grinds are multiplied over any previous method of generating external or internal screw threads.

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Greenfield Tap and Die Corporation

GEOMETRIC TOOL COMPANY DIVISION

New Haven 15, Connecticut

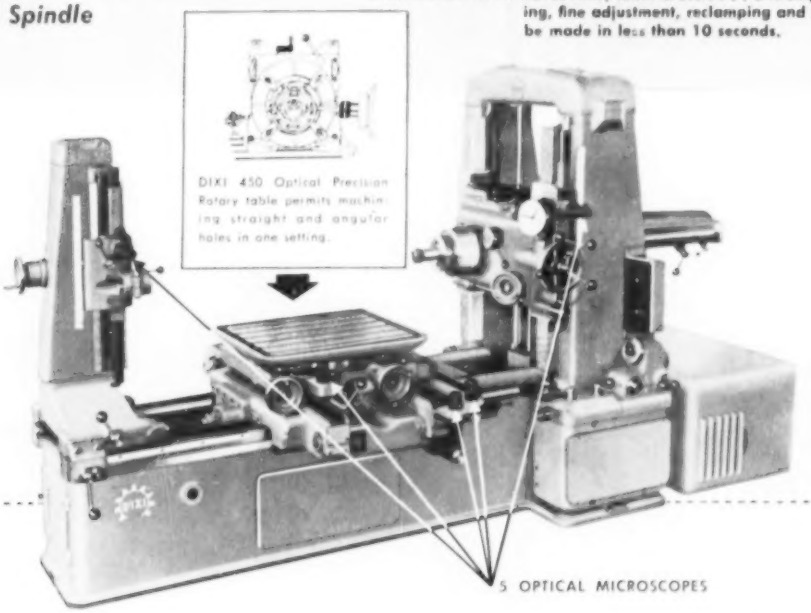
DIXI 60 *horizontal optical jig borer*

The ONLY Horizontal Jig Borer Built Today! Combines the ACCURACY of the Vertical Spindle With the VERSATILITY of the Horizontal Spindle

ACCURATE: Optical settings provide an overall accuracy of .0002.

VERSATILE: Optical settings for operations in all planes and compound angles . . . equally suitable for tooling, short-run or production work . . . permits JIGLESS boring, facing, milling and drilling.

PRODUCTIVE: Saves time, labor & costs . . . Unclamping, positioning, fine adjustment, reclamping and rechecking can be made in less than 10 seconds.


DIXI 450 Optical Precision Rotary table permits machining straight and angular holes in one setting.
5 OPTICAL MICROSCOPES

The DIXI Optical Reversing Process assures perfect alignment as well as round, taper-free holes. In work pieces with line bores on opposite sides, this is obtained by optically indexing the built-in rotary table 180°, locking the spindle feed and using the hydraulic table in-feed instead. Electrical infinitely variable speed spindle drive; infinitely variable hydraulic feeds; special features eliminate effect of spindle over hang on accuracy.

Made in Switzerland All measurements in inches

- Guaranteed service by factory trained staff
- Engineering staff available for consultation
- Spare Parts in New York stock
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DIXI 60 now in wide use in leading aircraft and manufacturing plants throughout the United States.

THIS VERSATILE MACHINE IN OPERATION at our New York, and other conveniently located Demonstration Centers.

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PRECISION CHUCKING MACHINE

Users say:

"We now get Production with Tool Room Accuracy"

Users enthusiastically tell us how they can easily maintain close tolerances, get better parts finish, and at the same time substantially cut costs . . . when they put Hardinge High Speed Precision Chucking Machines to work.

These results are possible because parts are finished in one setting with simplified tooling. All parts shown were produced with standard tool bits.

1 1/16" Collet Capacity— 6" Chucking Capacity— Write today for Bulletin HC-HCT which presents the whole story.

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because they combine Safety with Wearer Appeal!

AO 2-TONE ULTRASCOPIC SAFETY SPECTACLES

Plant eye protection programs *really work* when glasses like these guard workers' eyes! That's why safety directors everywhere have acclaimed the new AO F9700 2-TONE ULTRASCOPIC — and backed their enthusiasm for these safety glasses with a deluge of orders!

1. They know that they are buying a true safety frame as well as true safety lenses with *every* pair. A frame that will hold lenses and eyewire with a vise-like grip if hit severely. (Non-safety frames cannot provide this protection.)

2. They know that they are buying safety glasses with an eye-appeal that makes men and women workers exclaim "That's for me!"

You can see that the AO F9700 2-Tone Ultrascopic is *handsome* eye protection. You can also see that it is *safe* eye protection by the AO plaque on the frame front which indicates a true safety frame. That's why we say give your workers the SAFEST, the SMARTEST, the FINEST!

- 2-tone onyx on clear crystal plastic frame
- matching spatula temples
- 6 Curve Super Armorplate clear, medium Calobar, dark Calobar and extra dark Calobar lenses. Also available with clear Plastolite lenses.

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COMPANY
SAFETY PRODUCTS DIVISION

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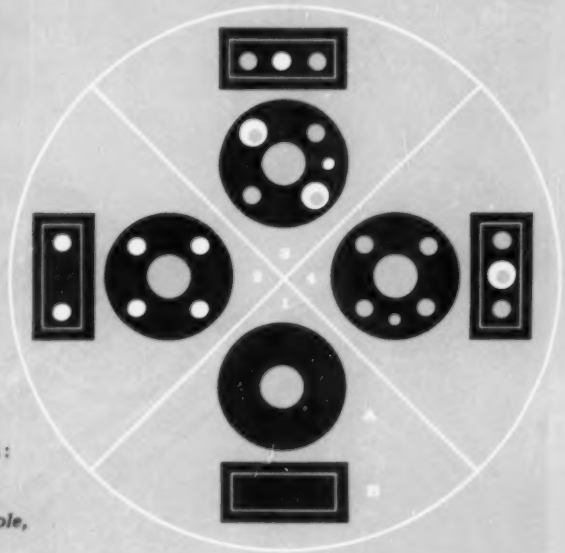
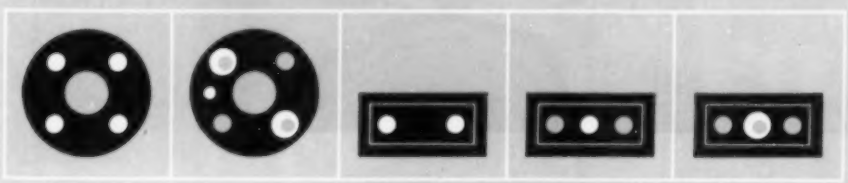
Cost-Cutting Ways
You Can Use
Standard Multi-Spindle Natcos

Any time your parts require machining *more than one hole*—drill, bore, face or tap—it may well be a "Natco Natural." Your standard Natco will produce substantial savings in a surprising number of situations, *even in small job-shop lots!* Call in your nearby Natco field engineer; he'll tell you in short order whether you've got a "Natco Natural" there.

Multiple Drilling Operations on Two Part-faces

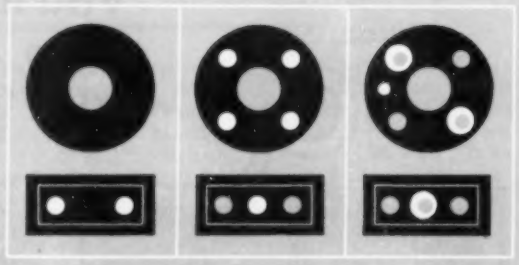


250 parts per hour—4-position rotary table. POSITION #1: *Unload finished part, transfer half-finished part, load new part.* POSITION #2: *Drill 4 holes, Face A. Drill and countersink 2 holes, Face B.* POSITION #3: *Drill 1 hole, ream 2 holes, Face A. Drill 1 hole, Face B.* POSITION #4: *Trepan 1 hole, Face B.*

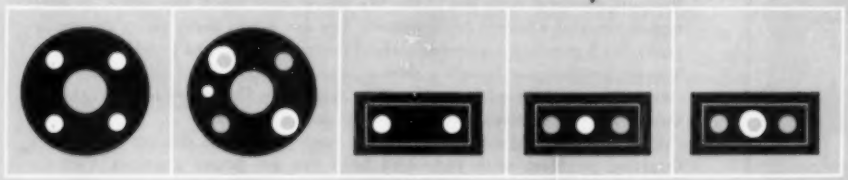


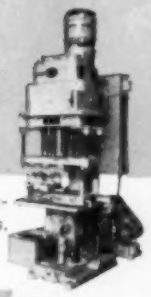
65 parts per hour—stationary fixture *with 5 work locations. Operator transfers parts after each stroke. One part completed per stroke.*

40 parts per hour—straight-line indexing. *After every 3 strokes, operator unloads finished part, transfers half-finished part and loads fresh part.*



23 parts per hour—tumble-type fixture. *Operator transfers and tumbles fixture from one position to the next. One part completed every five strokes.*





Standard multi-spindle Natcos range from 1 hp, 10-spindle machines to 50 hp machines with up to 72 spindles. Spindles in standard Natcos are driven through universal joints and located by either adjustable arms of bored slip plates.

NATCO

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Richmond, Indiana

Multi-spindle drilling, boring, facing & tapping machines. Special machines for automatic production.

Call Natco Offices in Chicago, Detroit, New York, Buffalo, Boston, Philadelphia, Cleveland, Los Angeles; distributors in other cities.

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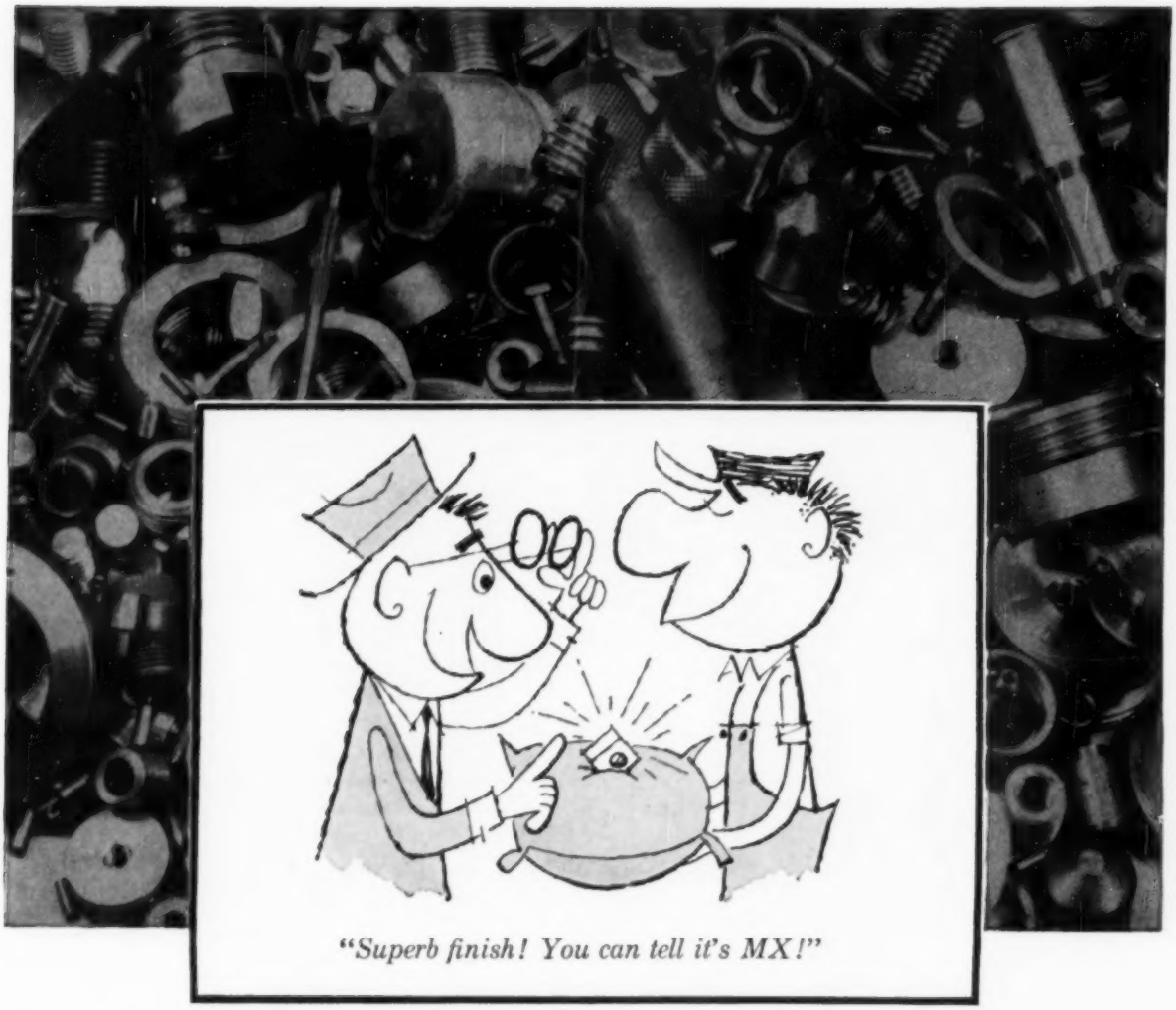
Our experienced engineers are at your service to discuss any Small Gearing problem with you—and help you get better answers. Call or write us—now.

SEND FOR *G.S. technical data, free! See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. Folder contains 23 pictures of Small Gears, plant views, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!*

41 Years of Specializing in Small Gearing!



"Superb finish! You can tell it's MX!"

"Production increased 27%—*finish excellent.*" "Costs reduced 24% with *finish greatly improved.*" "Tool life increased 200%—*superior finish.*"

These are statements we get from shops reporting on results they have obtained with USS MX Free-Machining Steel. Invariably they have good things to say about the finish of parts made from USS MX Steel.

In other words, this fast-cutting screw stock does more than boost output, increase tool life and cut costs. It enables you to produce parts that have the clean, sharp finish that stamps them as a quality product and makes them easier to sell.

The better finish you get with USS MX Steel results from two important properties – superior machinability and consistent uniformity . . . uniformity in cutting characteristics, in composition, and in freedom from injurious imperfections.

These qualities of MX Steel, maintained in shipment after shipment, not only beneficially affect part finish, but help to keep rejects to a minimum due to the fact that they make it possible to produce parts of close dimensional accuracy throughout the run.

Why not give MX Steel a trial in your own shop? *It costs no more than ordinary screw stock.*

Available in both Bessemer and Open Hearth grades, USS MX Free-Machining Steel is produced in all the popular screw stock sizes. It is sold in cold-finished form by your regular supplier, under either our trademark "MX" or his own identifying mark. "MX" Steel is available in hot-rolled form through any USS Sales Office.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Better finish . . . fewer rejects . . . lower costs

USS — *when you do the job with free-machining* **MX**

Registered trademark

UNITED STATES STEEL

THE MOST
That's Why More People

PERPENDICULAR TYPES
3 Graduations 7 Models

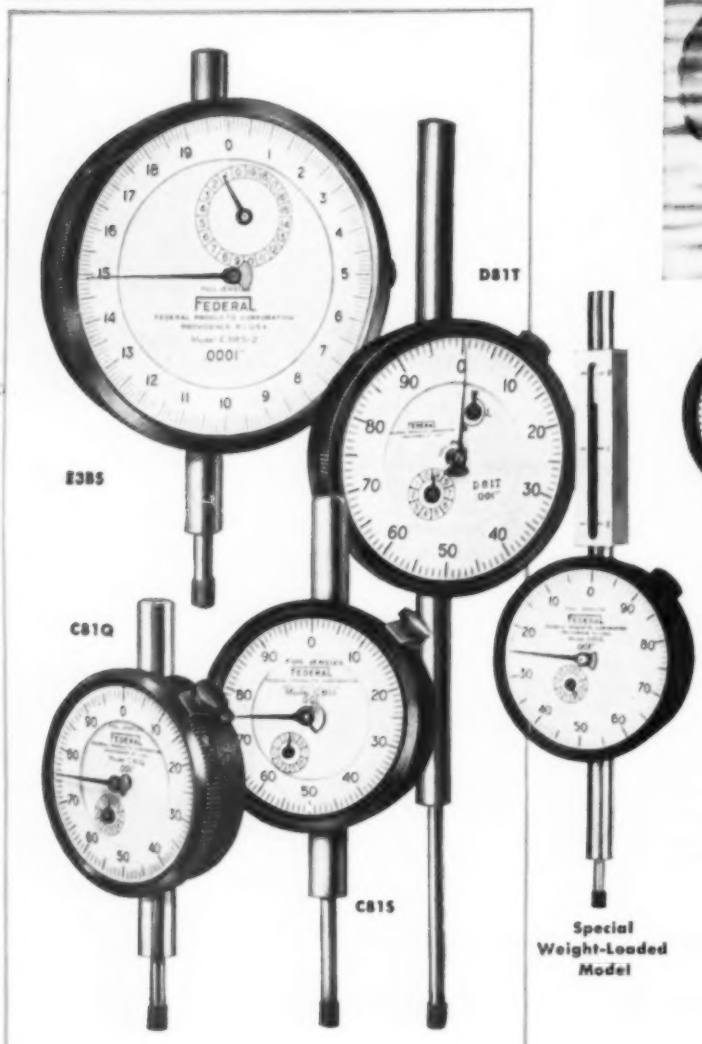
You get the greatest of all selections from which you can pick the right instrument for your job.

You get the benefits of doing business with a company which consistently offers improvements and new ideas.

You get a known accuracy and dependability built up over years of development and experience.

You save the confusion of stocking and maintaining several different makes of instruments.

LONG RANGE MODELS



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Completely Sealed

Completely protected from coolant, oil, oil fog, and water. Also protected from dust. Cushioned movement. Extra heavy case for rough usage. Extra strong mounting. Selection of 4 graduations, 6 ranges. A Federal "new".

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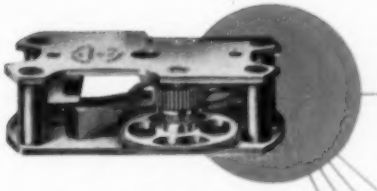

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Assures Perfect Alignment Positive Adjustment — Rigidity — High Accuracy . . .

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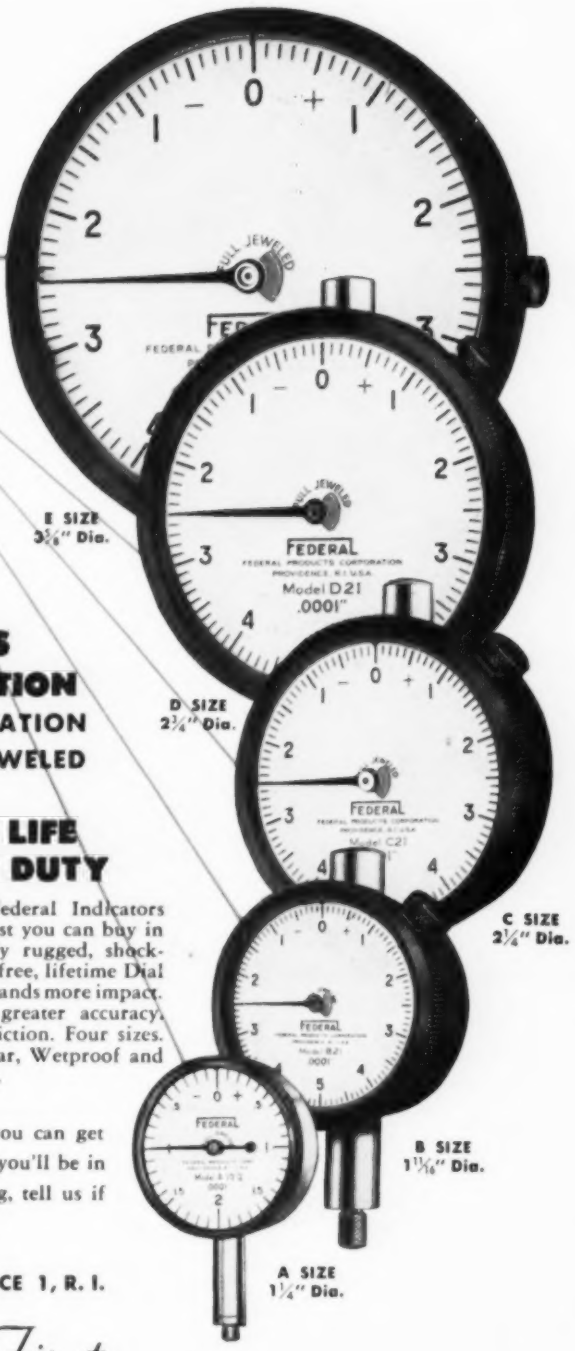
Another new in Federal Indicators (H Model). The best you can buy in every way. A really rugged, shockproof, maintenance-free, lifetime Dial Indicator that withstands more impact. Low maintenance, greater accuracy. 16% to 25% less friction. Four sizes. Furnished in Regular, Wetproof and Long Range models.



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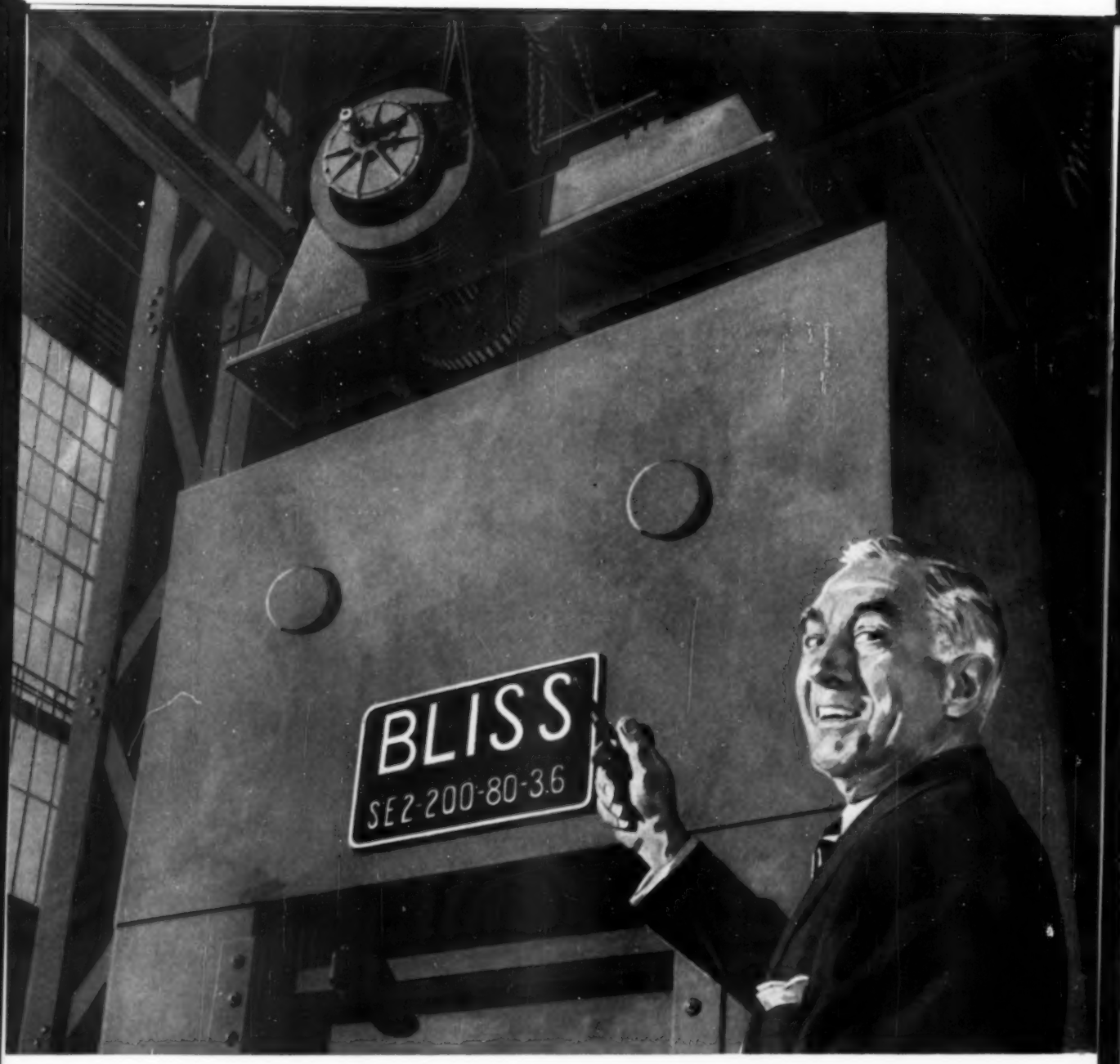

"This used to take hours...

now the whole gearcase comes off in minutes!" Quite an accomplishment for an enclosed eccentric press. Too often the advantages of the enclosed design are gained by sacrificing the accessibility of the open design. Not so with Bliss, however: Bliss engineers count practical maintenance a design "must"—any new design that comes off the boards at Bliss keeps the maintenance man in mind.

Which is one more reason why industry agrees, "Bliss is more than a name ...it's a guarantee."

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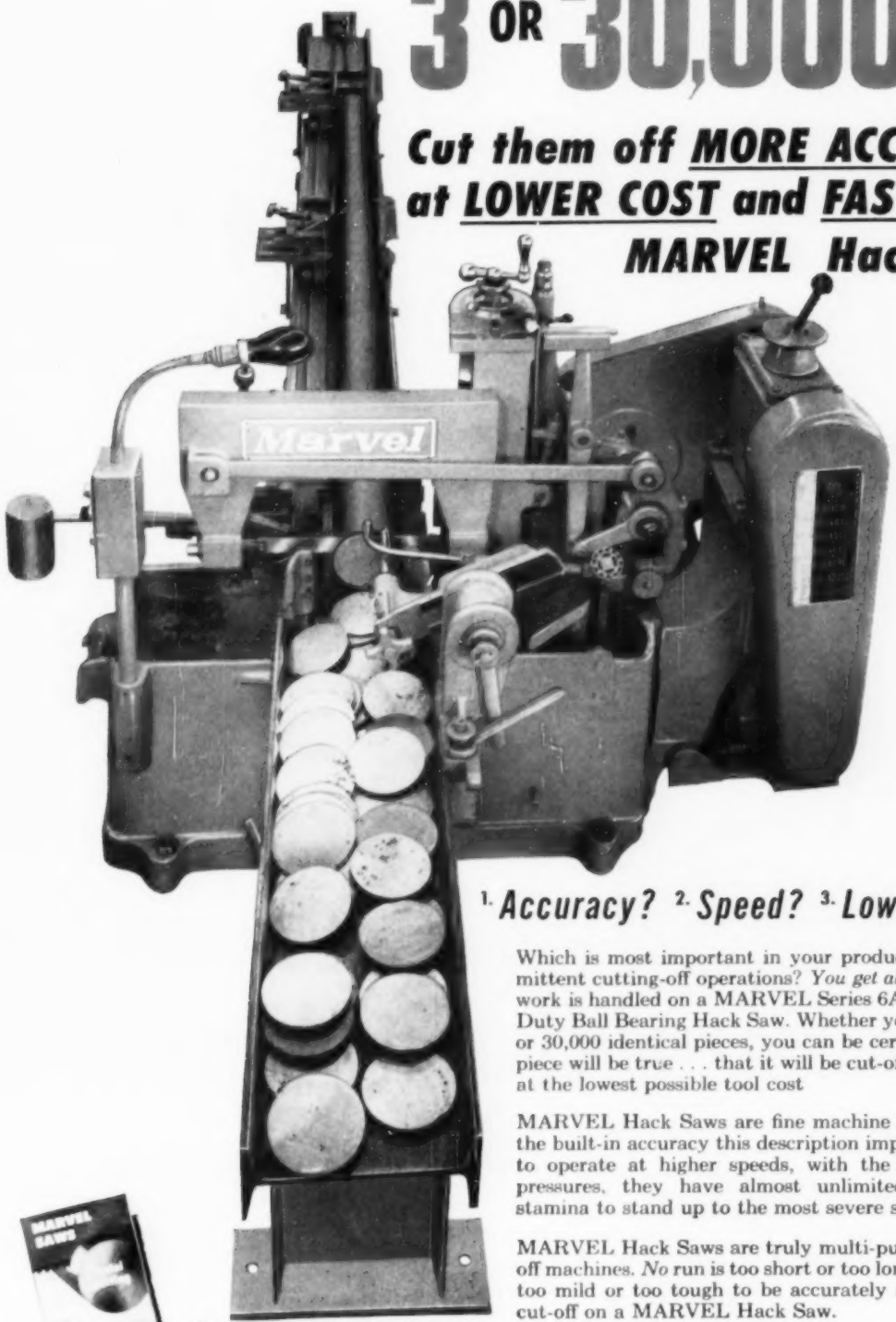
100 years of making metal work for mankind

PRESSES • ROLLING MILLS • MILL ROLLS • DIE SETS • CAN MACHINERY • ORDNANCE

3 OR 30,000 PIECES

Cut them off MORE ACCURATELY at LOWER COST and FASTER on a MARVEL Hack Saw



1. Accuracy? 2. Speed? 3. Low Cost?

Which is most important in your production or intermittent cutting-off operations? *You get all 3* when your work is handled on a MARVEL Series 6A or 9A Heavy Duty Ball Bearing Hack Saw. Whether you're cutting 3 or 30,000 identical pieces, you can be certain that each piece will be true . . . that it will be cut-off quickly, and at the lowest possible tool cost

MARVEL Hack Saws are fine machine tools, with all the built-in accuracy this description implies. Designed to operate at higher speeds, with the heaviest feed pressures, they have almost unlimited power and stamina to stand up to the most severe service.

MARVEL Hack Saws are truly multi-purpose cutting-off machines. *No* run is too short or too long, *no* material too mild or too tough to be accurately and efficiently cut-off on a MARVEL Hack Saw.

Catalog C56 has complete details, facts and figures on MARVEL Metal Cutting Saws. Write for it today.

5-1306

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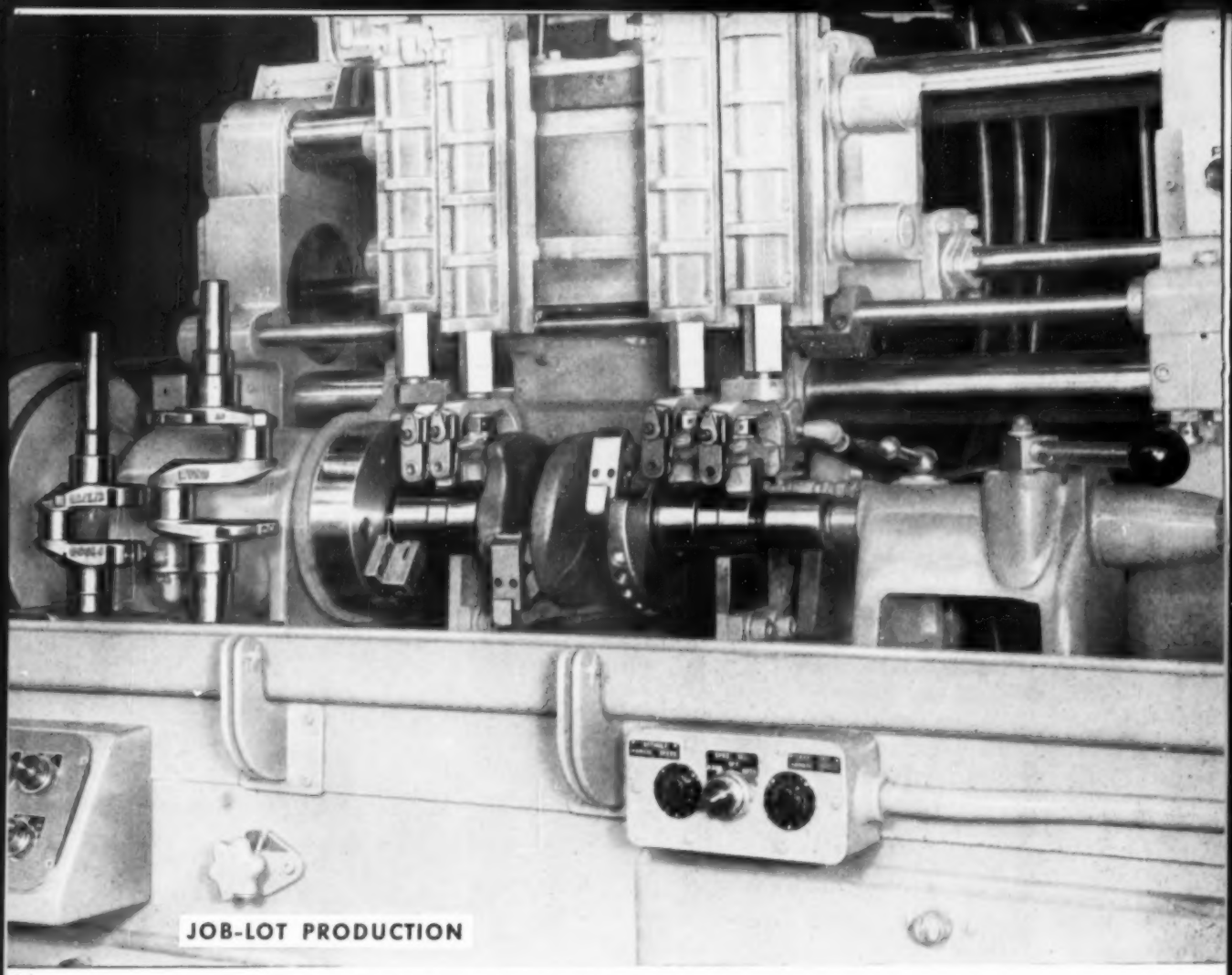
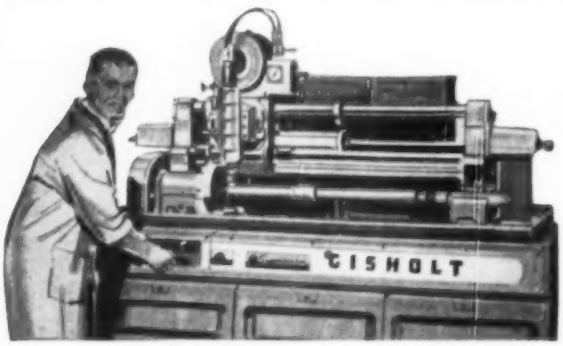
Metal Cutting **MARVEL SAWS**
Better Machines–Better Blades



No. 51A General Purpose Superfinisher

CRANKSHAFTS in small job-lots are Superfinished with this setup—holding the piece between centers and driving from a keyway with a faceplate driver. Latch-on follower-type arms Superfinish the crank pins, while the main bearing and oil seal surfaces are Superfinished by standard overhead quills. Main and pin bearings are taken from a ground surface of 30 micro-inches down to 8 or less. Oil seal surfaces on shaft ends are Superfinished to 4 or less. Production: 44 to 53 pieces per hour at 80% efficiency.

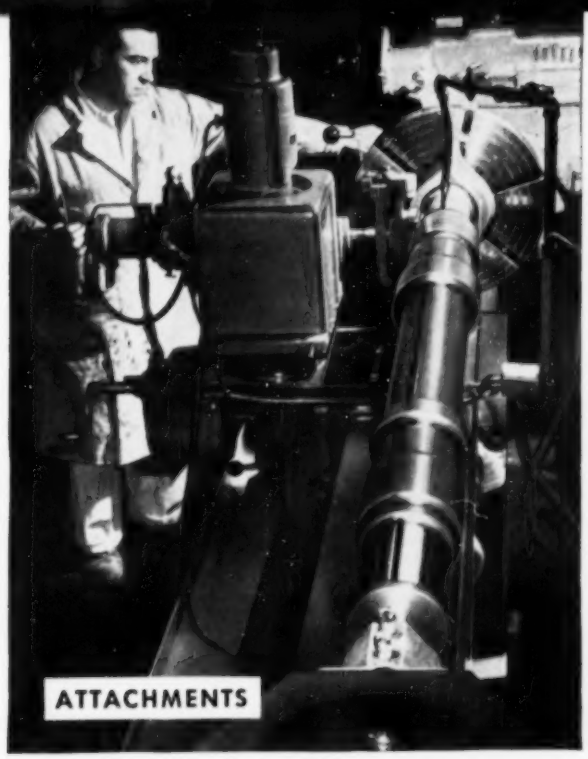
NEED SMOOTHER SURFACES AT LOW COST? See the



BEEN LOOKING FOR AN INEXPENSIVE PROCESS to improve product quality—to help market your product easier against increasing competition?

Gisholt Superfinishing may well be your answer ...it has been for some time for a long list of leading manufacturers.

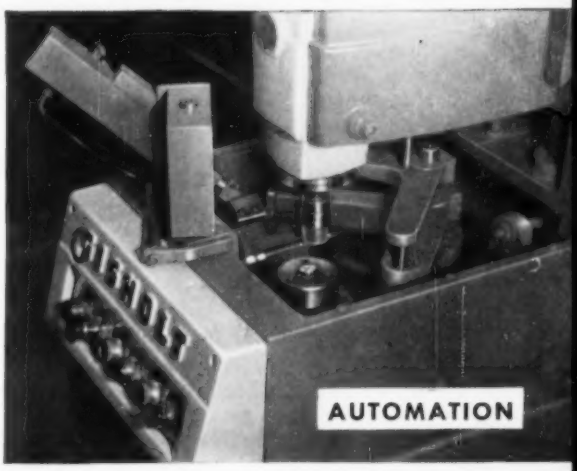
With this modern process, you'll definitely reduce —or even eliminate—the cost and time of grinding, polishing or buffing operations. With the exclusive Gisholt Superfinishing method, you utilize a "scrubbing" effect through an abrasive stone which oscillates as the work rotates. Chatter marks, grind-



No. 4 Superfinisher Attachment

AXLE JOURNALS for railroad switchers are Superfinished with No. 4 Attachment on Gisholt Saddle Type Turret Lathe in this operation. In three steps, lathe finish of 200-250 micro-inches RMS is reduced to final surface finish of 8-10 RMS, removing .004" to .005" stock to eliminate tool marks. Through Superfinishing, 25 switchers logged 30,000 trouble-free hours on journals in first few months.

Superfinished tappet with .005-inch crowned top.



No. 81 High Production Superfinisher

CAST IRON VALVE TAPPETS are Superfinished in long runs on this job, featuring fully automatic handling with a work transfer device. Cup-shaped stones are used, Superfinishing from flat ground surface down to 5 micro-inches RMS or less—and rotating off center to generate .005" crown on the cam end of each tappet. In only 16 seconds floor-to-floor time per piece, the valve tappets are economically Superfinished for longer wear life and better product quality.

NEW GISHOLT MASTERLINE SUPERFINISHERS

ing flats, and amorphous "smear" metal left by grinding are completely removed. The true base metal is exposed—providing longer wear and better performance from your product.

Better still, most Superfinishing jobs are done in a fast, automatic cycle—producing very low micro-inch surface readings in the shortest possible time.

The jobs shown here are typical examples where Superfinishing solved production problems and improved product quality. Ask your Gisholt Representative to tell you about them—and many more—in full detail. Call him today!

WRITE TODAY for 30-page illustrated booklet "Superfinishers," explaining Gisholt Superfinishing process in interesting detail.

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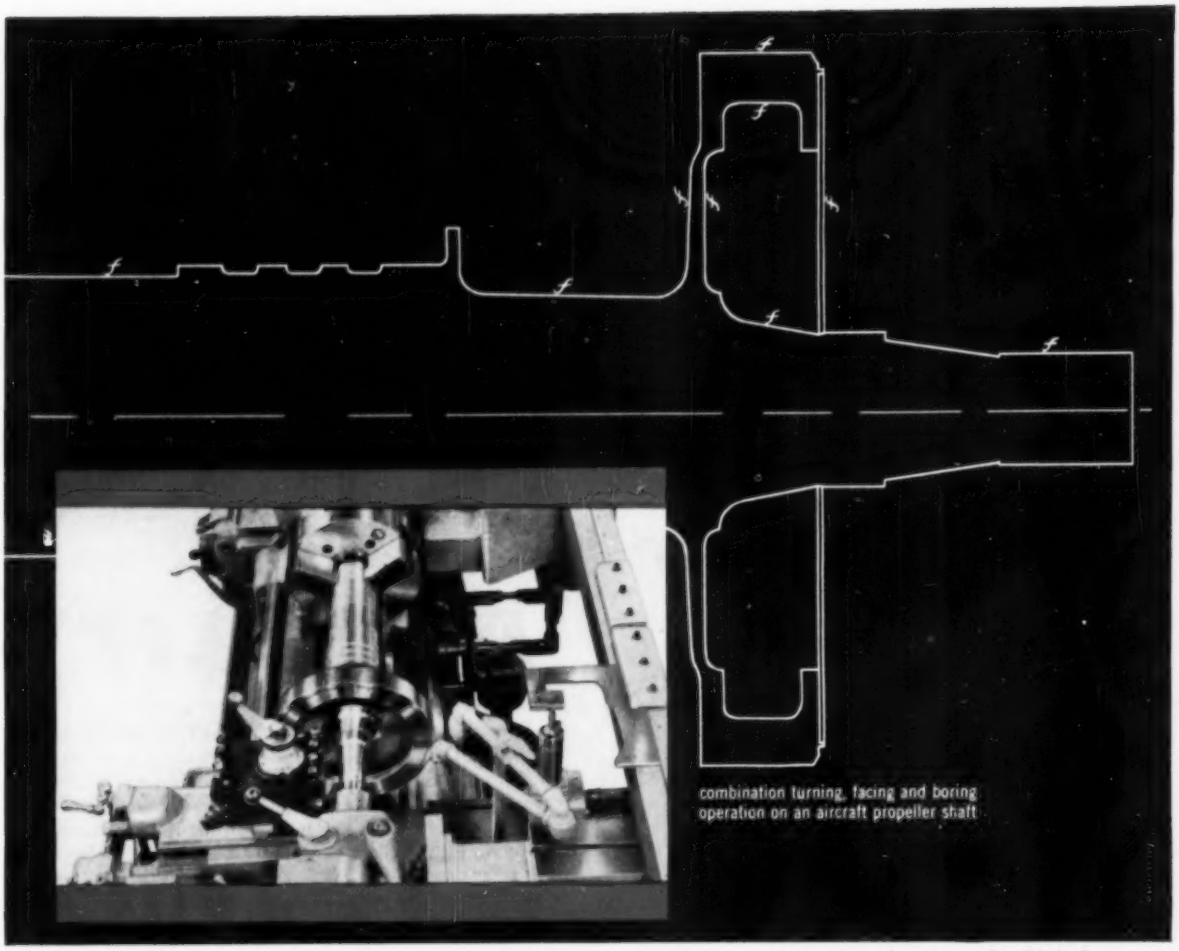

combination turning, facing and boring operation on an aircraft propeller shaft

Duplicate complex curves . . . quickly . . . easily . . . with the Lodge & Shipley

DUAL TRACER

lathe and all-hydraulic 360° control

The machining of complex contours on the periphery, bore or face of a workpiece is the job for which the Lodge & Shipley DUAL TRACER was perfected. In addition to this facility, the DUAL TRACER can handle conventional tracing jobs or can be changed over almost instantly to standard lathe operation. This versatility removes the DUAL TRACER from the limited use that makes the "special lathe" an uncertain investment.

Chances are the DUAL TRACER can do your job faster and more economically. Consult our sales engineering department. For details, write: **The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio.**

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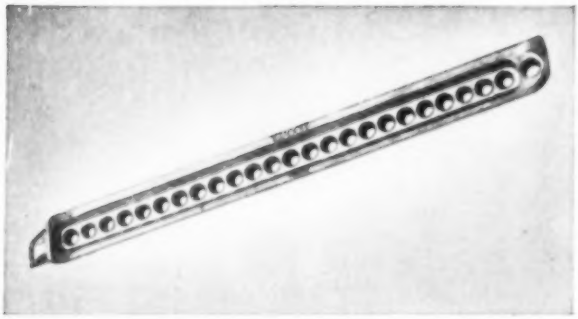
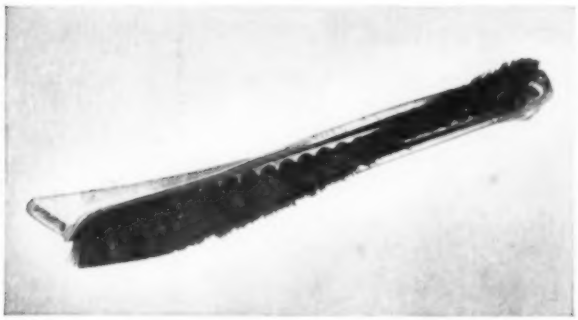
There's a Good Reason why
ZINC DIE CASTINGS
are so widely used

...at HOOVER ...IT'S

DUCTILITY





The straight die casting (at top) is put into production without any machining. The bristles are fastened in place and the forming operation twists the bar to the proper curvature for installation on the agitator.

Design engineers at The Hoover Company found that DUCTILITY provided the necessary answer to their problem of using ZINC Die Castings in the agitator of the upright electric vacuum cleaner.

Because of the helical contour of the brush, the metal back could not be die cast to the required shape since the anchoring holes for the bristles would not be parallel to the motion of the die. The problem was neatly solved by a die caster who knew how to use the exceptional qualities of ZINC Die Castings.

The brush backs were cast straight, the bristles anchored in the holes and the castings were then cold formed approximately 115° to give the necessary helical contour. Even with the extra forming operation, die casting proved to be the most economical method of production since no machining was necessary.

Ductility is just one of the many physical and mechanical advantages that make ZINC Die Castings so widely used by manufacturers who want the best product with lowest costs of parts and assemblies.

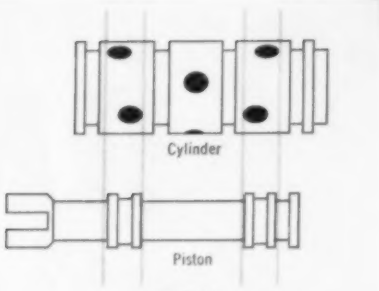
ZINC
FOR DIE CASTING ALLOYS

THE NEW JERSEY ZINC COMPANY *160 Front Street, New York 38, N. Y.*

The research was done and the Zamak die casting alloys were developed with

HORSE HEAD SPECIAL (99.99 + % Uniform Quality) ZINC

MATCH PISTON LANDS TO CYLINDER PORTS PRECISELY WITH SHEFFIELD'S MICRO-FORM GRINDER



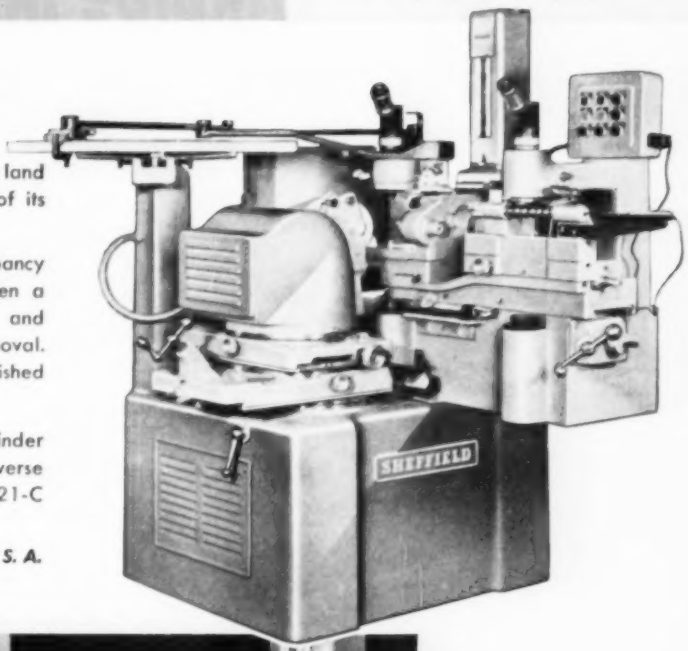
This servo cylinder and piston are typical of the very precisely machined hydraulic components in aircraft propeller and flight control systems.

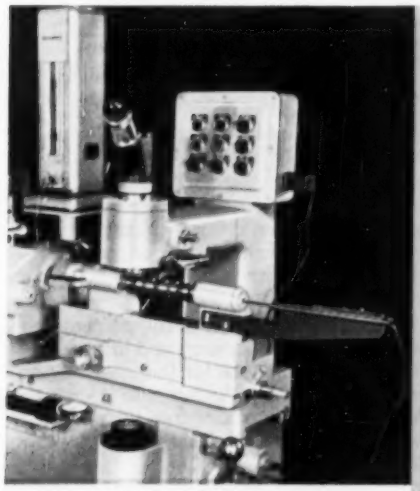
With the actual cylinder as a reference, each piston land is individually ground to match the inside edge of its respective cylinder port.

If a flow test then reveals the slightest discrepancy between land and port edge, the piston is given a finishing touch, using a Sheffield Precisionaire and Airetest Indicator to show progress in stock removal. Thus, the correction of the land face can be accomplished to within ± .000010".

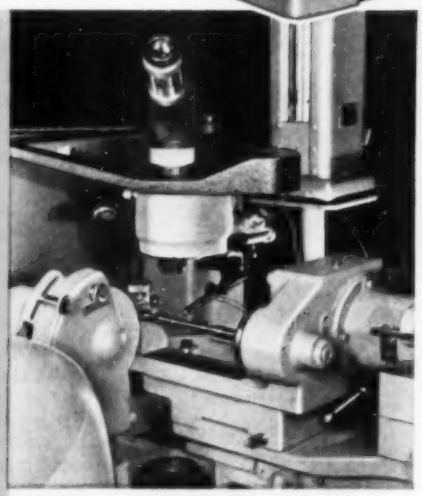
This is typical of the wide range of Micro-Form Grinder applications in duplicating precision profiles or reverse profiles from a master. Write for Bulletin MFG-121-C to Dept. 1.

THE SHEFFIELD CORPORATION, DAYTON 1, OHIO, U. S. A.





Cylinder under observation on auxiliary table.



Airetest Indicator shows stock removal in final correction.

the **SHEFFIELD** *corporation*
of Bendix Aviation

7560

manufacture and measurement for mankind

New ARMSTRONG

Armide CARBIDE INSERT TOOL HOLDERS

STYLE TR
(opposite Hand TL)
Holds Triangular 6-edge, Armide and other carbide "throw-away" inserts.

STYLE SR
(opposite Hand SL)
Holds square, 8-edge, Armide and other carbide "throw-away" inserts.

Buy **ARMSTRONG TOOLS** from your Industrial Distributor

Write for catalog

Embody...Convenience, Economy Simplicity and Strength based on these superior features:

- **IMPROVED CLAMPING METHOD**—speeds indexing of Inserts.
- **REPLACEABLE SEAT** of Hardened Tool Steel—protects shank and provides flat base to prevent damage to inserts as they are clamped in position.
- **SHANK** of Heat Treated Alloy Steel—gives extra strength and rigidity.

A slight turn of a single screw permits rapid indexing of the ARMIDE insert—reducing down time to a minimum.

The use of ARMIDE "throw away" inserts provides the economy of multiedged inserts—triangular inserts have six, square inserts eight cutting edges. These are available in Utility or Precision finish and in three grades of ARMIDE: 350, 370 or 883.

Protection to the shank is given by the replaceable tool steel seat which prevents wear and damage to the shank and provides a flat base for the insert reducing the possibility of damage to the insert as it is clamped in place. A relief groove is ground into the seat providing clearance when a dulled insert with "built up" edges is turned over.

ARMSTRONG ARMIDE Carbide Insert Tool Holders are furnished in two styles and three sizes. Complete data on these tools is given in Bulletin CIT, mailed on request.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVENUE **CHICAGO 30, ILL.**

Columbia Tool Steels for 1957-58
with A.I.S.I. Identification and Type Classification of Tool Steels

GRADE	Identifying Elements, in Per Cent										
	Type	C	Mn	Si	Cr	Ni	V	W	Mo	Co	Cb
HOT WORK TOOL STEELS — TYPE SYMBOL H											
H1-H19, INCL., CHROMIUM BASE TYPES (H1-H10 AND H17-H19 UNASSIGNED)											
FIREDIE - CASTDIE	H11	.35	—	—	5.00	—	.40	—	1.50	—	—
ALCODIE	H12	.35	—	—	5.00	—	.40	1.50	1.50	—	—
VANADIUM CASTDIE	H13	.35	—	—	5.00	—	1.00	—	1.50	—	—
	H14	.40	—	—	5.00	—	—	5.00	—	—	—
	H15	.40	—	—	5.00	—	—	—	5.00	—	—
	H16	.55	—	—	7.00	—	—	7.00	—	—	—
H20-H39, INCL., TUNGSTEN BASE TYPES (H27-H39 UNASSIGNED)											
	H20	.35	—	—	2.00	—	—	9.00	—	—	—
FORMITE 2	H21	.35	—	—	3.50	—	—	9.00	—	—	—
	H22	.35	—	—	2.00	—	—	11.00	—	—	—
	H23	.30	—	—	12.00	—	—	12.00	—	—	—
FORMITE 3	H24	.45	—	—	3.00	—	—	15.00	—	—	—
	H25	.25	—	—	4.00	—	—	15.00	—	—	—
CLARITE J	H26	.50	—	—	4.00	—	1.00	18.00	—	—	—
CLARITE HW	H26	.50	—	—	4.00	—	1.00	18.00	—	—	—
H40-H59, INCL., MOLYBDENUM BASE TYPES (H40, H44-H59 UNASSIGNED)											
	H41	.65	—	—	4.00	—	1.00	1.50	8.00	—	—
	H42	.60	—	—	4.00	—	2.00	6.00	5.00	—	—
MOLITE HW 10	H43	.55	—	—	4.00	—	2.00	—	8.00	—	—

Third of a Series of Six Charts Covering A.I.S.I. Tool Steel Type Classifications

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILLINOIS

CENTRAL OFFICE AND WORKS, CHICAGO HEIGHTS, ILLINOIS — BRANCH STOCKS IN THE FOLLOWING CITIES:

Chicago 32
4832 S. Kedzie Ave.
Phone LAfayette 3-3632

Cincinnati 25
2716 Spring Grove Ave.
Phone MUlberry 1-8400

Cleveland 14
1640 St. Clair Ave.
Phone MAin 1-1785

Detroit 3
121 Oakman Blvd.
Phone TUlsa 3-3770

Los Angeles 22
6955 E. Bandini Blvd.
Phone RAymond 3-4684

Milwaukee 19
5202 W. Lincoln Ave.
Phone LIncoln 3-5200

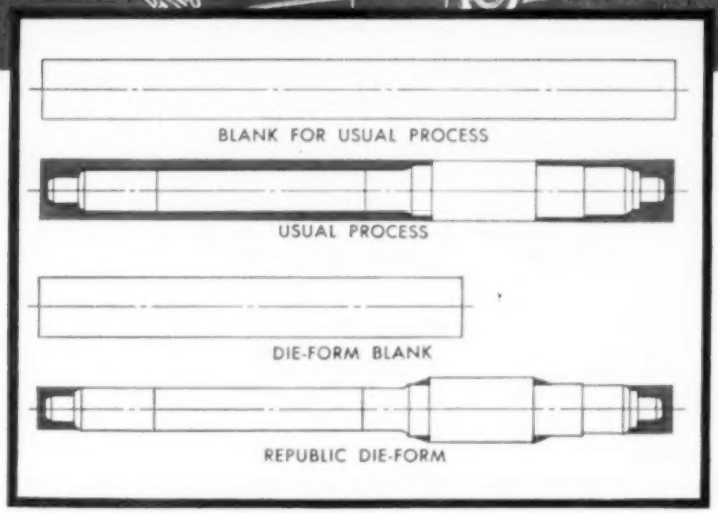
St. Louis 13
5118 Easton Ave.
Phone FOrest 1-0641

REPRESENTATIVES IN THE FOLLOWING CITIES: Dayton, Erie, Grand Rapids, Hartford, Indianapolis, Louisville, Moline, Newark, Portland and St. Paul

TOOL COLUMBIA STEELS

COLUMBIA TOOL STEELS

HIGH SPEED STEELS: Clarite — Vanite — Carvite — Acmite — Cobite — Maxite — Molite — Molite Smoothcut — Molite #3 DIE STEELS: Superdie — Atmodie — Atmodie Smoothcut — E-Z-Die Smoothcut — Oildie — Exl-Die — Framdie SHOCK RESISTING STEELS: Buster Alloy — CEC Smoothcut CARBON TOOL STEELS: Columbia Special — Vanadium Extra — Waterdie Extra — Columbia Extra — Columbia Extra Headerdie — Vanadium Standard — Waterdie Standard — Columbia Standard — Columbia Electrex



YOU CAN SAVE UP TO 1 OUT OF 3 TONS OF STEEL

when you specify Republic Die-Form for high-volume production of multi-diameter machine shafts. Drawings and photographs show dramatic savings actually made possible in an automotive transmission shaft. In this case, 200 tons of cold formed blanks produced parts formerly requiring 300 tons. Machining time was reduced accordingly.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

REPUBLIC DIE-FORM

What It Is. The Republic Die-Form process is a new method of cold forming hot rolled carbon, alloy, or stainless steel bars into multi-diameter bars ready for final finishing.

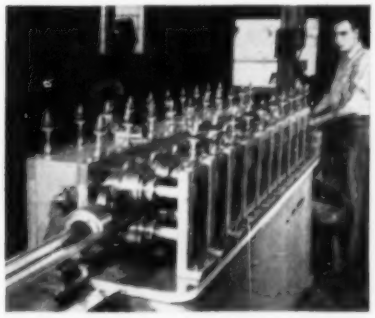
What It Does. Use of Republic Die-Form instead of conventional bar stock permits major savings in time, steel, and money in mass produced, multi-diameter machine shafts. Since Die-Form closely approximates the final part, only finishing cuts and/or grinding are required for completion. Scrap loss is minimized—production rate increased.

Savings in time and steel mean dollar savings. However, costs may be further reduced through decreased capital investment in machine tools, and elimination of excess weight-handling costs in raw material and scrap disposal.

Finally, Republic Die-Form processing increases tensile strength and machinability of any given hot rolled steel analysis used. These characteristics assure an outstanding surface on completed parts, provide further reductions in machining time and permit the possibility of heat treatment elimination.

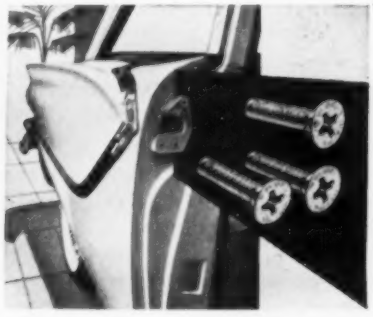
Capacity and Limitations. Republic Die-Form is available up to two inches in diameter. It is limited to symmetrical cross sections of two or more diameters. "Hourglass" sections cannot be produced. Die-Form is economical only in large production runs.

Plan now to check the savings potential of Republic Die-Form in your machined shaft production. Contact your Republic office for full details. Or write for illustrated literature, ADV-746.



SAVE PAINT PREPARATION COSTS on your formed steel products by specifying Republic Electro Paintlok®. Special paint-holding surface is applied at our mills. It won't crack, flake or peel, even under severe bending, as demonstrated by this acoustical fastener forming operation. Final finish can be applied immediately, with excellent results. Mail coupon for data.

TIME, LABOR, AND SPACE SAVINGS were all realized through use of Republic Roll-Over Boxes for this bulk chemical handling operation. Former laborious methods involving bagged material were eliminated. Now one man with revolving-fork truck does the job faster, more efficiently. Check advantages of Republic's complete materials handling line. Send coupon.



LIFESAVING DOOR LATCH striker plate is permanently anchored to door post with Republic Nylok® Bolts. Nylon pellet in body of bolt forces strong metal-to-metal lock between opposite mating threads. Resiliency of pellet provides excellent adjustability and re-use characteristics—and provides liquid seal when bolts are seated. Send coupon for facts.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. C-4108
3102 EAST 45th STREET • CLEVELAND 27, OHIO

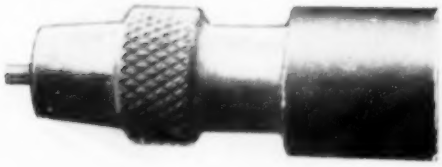
☐ Please send me Republic Die-Form Folder, ADV-746.
Please send me more information on:
☐ Nylok Bolts ☐ Materials Handling Equipment
☐ Electro Paintlok Sheets

Name _____ Title _____

Company _____

Address _____

City _____ Zone ____ State ____



NEW WEST·ING·GUN

Cuts Welding Costs! Speeds Production!

GETS EVERYWHERE!

Hard-to-weld Metals Now Welded Automatically! There is now a portable hand gun—for gas-shielded welding of aluminum, mild and stainless steels, bronze, copper and magnesium! Moreover, this hand gun has its *own self-contained wire supply!*

It is named the WEST-ING-GUN. It works with any standard DC welding machine. It has *averaged* horizontal fillets of 22 inches-per-minute—with $\frac{1}{16}$" wire! Throughout *extensive* field tests, this WEST-ING-GUN has *doubled men's daily output!*

OPERATOR FATIGUE "ELIMINATED"! This WEST-ING-GUN "handles" as easily as pointing your finger, to weld in *any* position—regardless of cramped quarters! Its portability between gun and control—between control and power-source—provides complete working freedom and ease—up scaffolding—atop ladders—all around any type of workpiece. This gun weighs only four pounds—including its full, pound reel of wire! Operators working a steady 30% duty cycle, with WEST-ING-GUNS, say they "feel no fatigue at all"!

Welding Remote from Power Source!

20-lb control is readily carried up superstructures! Every shipyard visited, during field-tests, immediately ordered WEST-ING-GUNS!

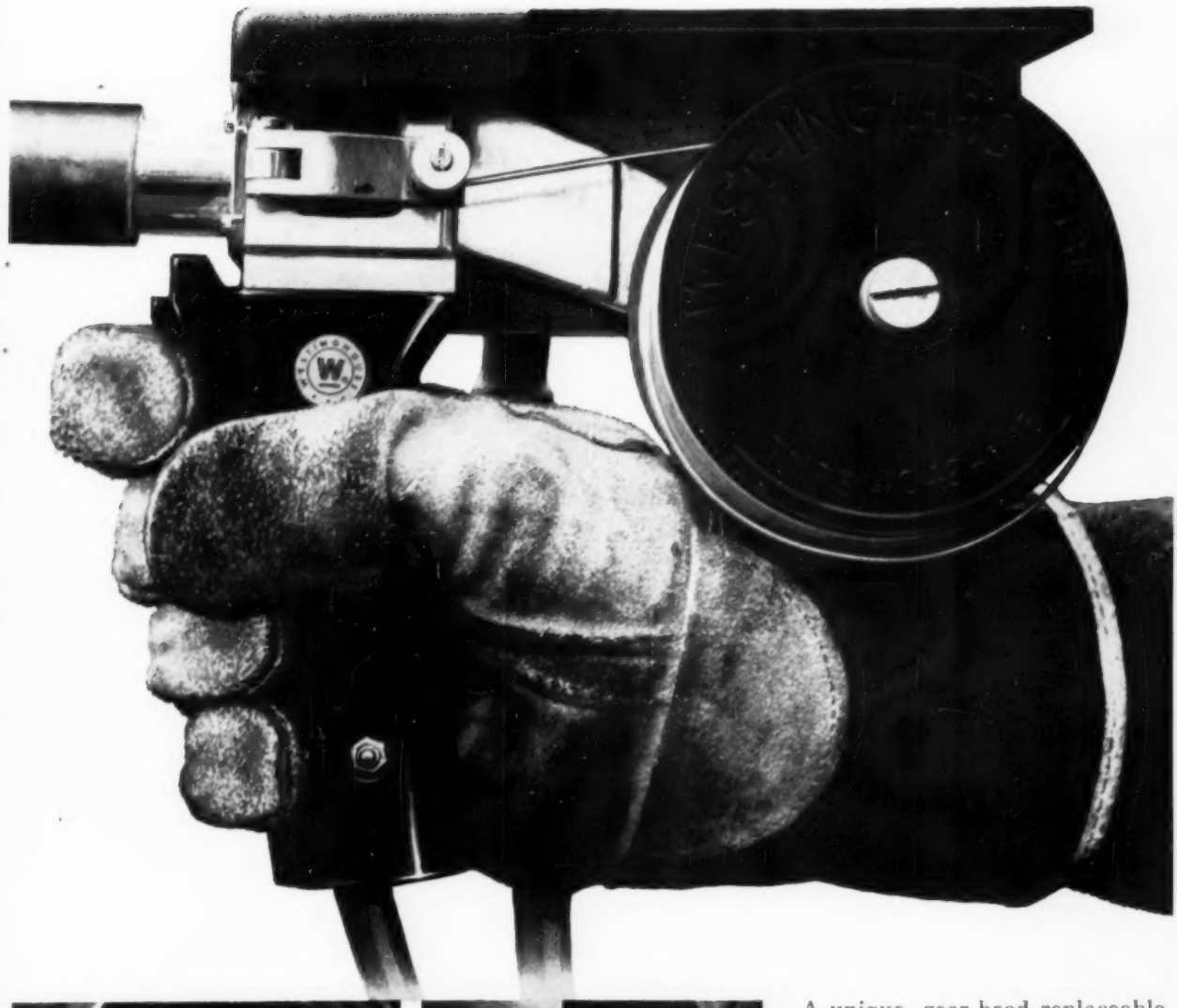
Time Saved in Tight Quarters!

Weld wherever you please! Power and shielding gas are in a single-hose assembly. This permits access to heretofore "impossible" locations!

New Welding Speed on Big Units!

You can take the gun wherever you want to weld! The control stays with the machine! One man can now do the work that used to require two!

Watch Westinghouse for New Developments



Maintenance Welding Simplified!

WEST-ING-GUNS and lightweight control units do the job quickly! Invaluable as a time- and cost-saving production tool!

Aircraft Quality Welds Every Time!

Difficult welds are readily completed with new ease—in production of aircraft equipment—often well back into normally inaccessible areas!

A unique, gear-head replaceable mechanism in the handle drives 1/16" wire up to 350" per minute (finer wire *twice* as fast)! Wire is "inched" at the touch of a button. The short, 6" travel eliminates wire-feeding problems!

There are WEST-ING-GUNS and the controls available—for any DC welders. The compact, rugged control-unit for each model weighs less than 20 pounds. Virtually *every* welding shop has *countless* applications where WEST-ING-GUNS will save *appreciable* amounts of money!

Avail yourself of the opportunity to see what this new production tool can do for you! Contact your nearest franchised Westinghouse Welding Distributor; or write to the Westinghouse Welding Laboratories, Box 2025-A, Buffalo 25, New York.

J-22100

in Welding

CUT COSTS ...SPEED DRILLING OPERATIONS

with "BUFFALO" DRILLS

The enthusiastic industry-wide acceptance of the No. 1 "RPMster" is a matter of quiet pride with us at "Buffalo". First, we found out what you people in the industry wanted . . . as the ultimate in drill features. Then, we drew upon our 80 years of engineering experience to design these most-wanted advantages into this "drill to surpass all previous drills".

The results speak for themselves. Here, in the "Buffalo" No. 1 "RPMster" are *all* the benefits you wanted most. You'll find extreme accuracy, high output, complete convenience. The ingenious gearless drive offers the widest range of spindle speeds, from 100 to 3000 . . . instantaneously adjustable. Operation is so effortless, quiet, versatile and vibrationless that you'll have to operate it yourself before you'll believe it's possible.

Phone your nearest "Buffalo" Machine Tool Dealer for a demonstration of the No. 1 "RPMster" . . . or write for Bulletin 3967-A.

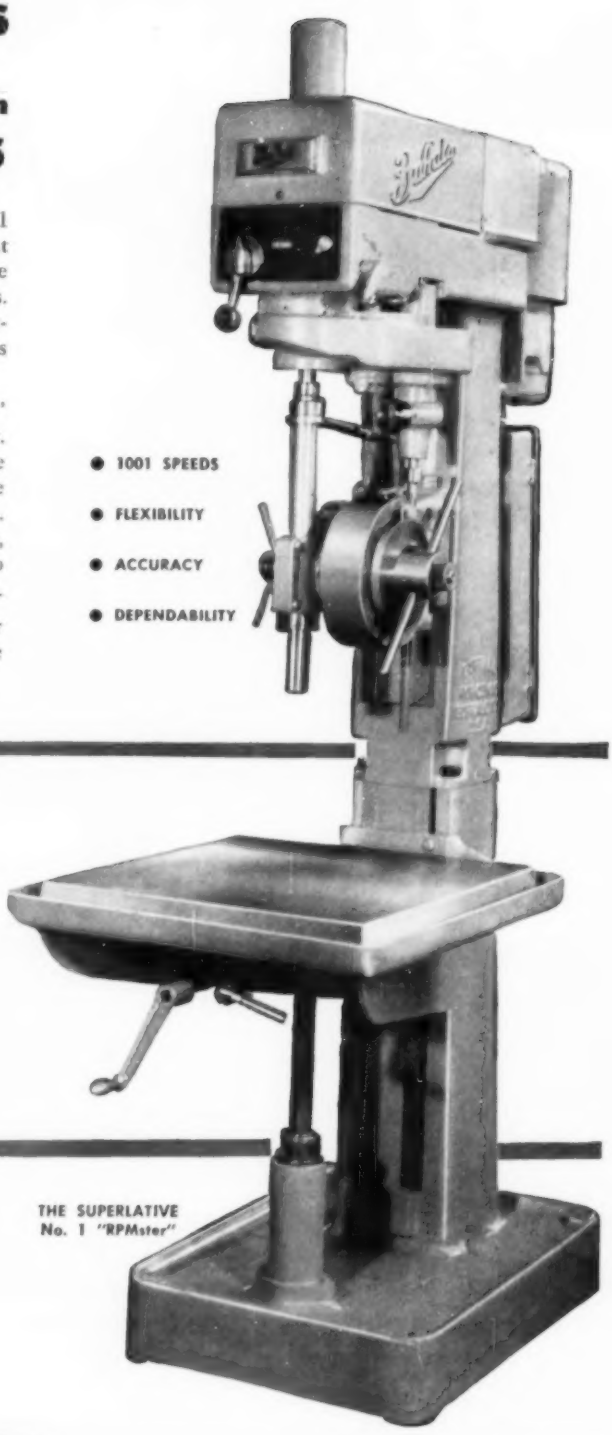
- 1001 SPEEDS
- FLEXIBILITY
- ACCURACY
- DEPENDABILITY

"Buffalo" No. 18 DRILL

Easy to operate, the No. 18 is a high-grade, stationary-head, general-purpose drill. Suitable for shop or production work up to 1-inch cast iron. Nineteen models available in bench and floor types, with multiple units up to 6 spindles in pedestal type. For full details, write for Bulletin 3125E.

"Buffalo" No. 16 DRILL

You get a lot in the No. 16 Drill — high sensitivity and accuracy, combined with rigid, durable construction. Ideal for shop or production work, it's available in 8- 12- and 15-inch overhang — in bench, floor or pedestal types — in multiple units up to 6 spindles. Write for Bulletin 2750G.



THE SUPERLATIVE No. 1 "RPMster"

Engineered into every "Buffalo" Drill is the famous "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.

DRILLING • PUNCHING • SHEARING • BENDING

"Buffalo"

BUFFALO FORGE COMPANY

509 BROADWAY • BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

look your problem in the eye

No need to scratch around for a solution to your grinding wheel problems. Switch to CINCINNATI (PD)° WHEELS. For *now* CINCINNATI GRINDING WHEELS offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that *can save you money . . . and increase your production.*

And there's no reason to howl when it comes time to duplicate the original wheel when you reorder, for CINCINNATI (PD) WHEELS assure you of POSITIVE DUPLICATION of the original wheel every time you reorder. "On Grade" with a CINCINNATI (PD) WHEEL means all future (PD) wheels will perform and grind exactly alike.

Yet, CINCINNATI (PD) WHEELS will cost you no more than ordinary wheels.

So, today, see your CINCINNATI GRINDING WHEELS Distributor. He'll be glad to explain how (PD) WHEELS will save you money and increase production. Or contact us direct and we'll send one of our representatives—specialists who know grinding and grinding machines as well as grinding wheels. Write, wire, or telephone Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

Remember—only CINCINNATI GRINDING WHEELS give you

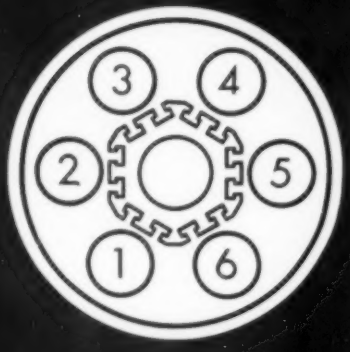
(PD) POSITIVE DUPLICATION

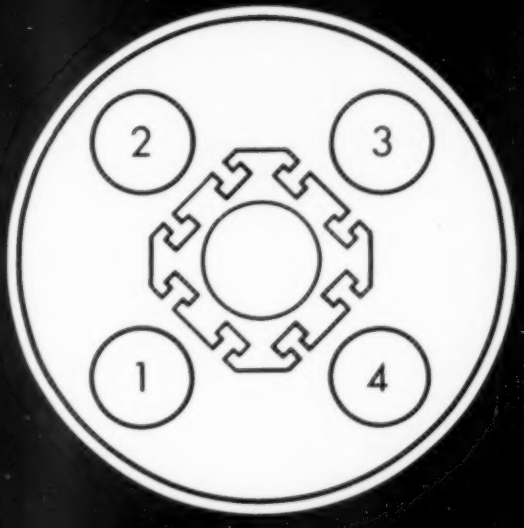
CINCINNATI
Grinding Wheels

°Trade Mark Reg. U.S. Pat. Off.

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

a message to production-minded engineers with automated equipment in mind





These multiple-spindle diagrams are symbols of one of the earliest, simplest, and yet most efficient forms of automation the world has yet known. They represent circumferential automation, a design principle embodied in the development of the first automatic screw machine, built in 1893 by National Acme and inherent in all Acme-Gridleys since then.

don't overlook the advantages of

circumferential automation*

* Think of each spindle on an Acme-Gridley multiple-spindle automatic as a work station, and you will quickly see that here, too, is automation . . . *circumferential* automation. Here, as in all forms of automation, pre-sequenced operations are *performed in succession—and without manual attention*—to save time and cut costs in many ways.

Actually, circumferential automation goes all other forms one step better; rather than requiring a line of machines and transfer arrangements, Acme-Gridley's speedy, compact spindle arrangement *saves floor space, machine investment and man hours.*

Admittedly, multiple spindle operation is not the answer to all machining problems. Today however, production men are taking a closer look to be sure they are missing no bets. They cannot afford to be wrong tomorrow.

Is there a place for *circumferential* automation in *your* operation? Let us help you find out.

National Acme

THE NATIONAL ACME COMPANY, 171 E. 131ST ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N. J., Chicago 6, Ill., Detroit 27, Mich.

builders of the world's most complete line of multiple-spindle, bar and chucking automatics

Save Time with STANDARD STOCK BROACHES

Minute Man

KEYWAY BROACH KIT

In one minute and for as little as one cent you can cut a keyway with this kit. For keyways from 1/16" to 1" in any bore from 1/4" to 3".

Minute Man

SQUARE BROACHES

HEXAGON BROACHES

***New* ROUND BROACHES**

Used in an arbor or hydraulic press for finishing holes to exact size in *one pass*. 1/8" to 3/4" squares and hex's; 1/4" to 1" rounds. Production Type Keyway Broaches also in stock.

SEND FOR CATALOG AND PRICE LIST

The duMONT CORPORATION
Greenfield, Mass.

MAIL FREE BROACH CATALOG AND PRICE LIST A describing Square Broaches, Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

Name .....

Company .....

Address .....

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Anchor bolt answers

Dear Sirs:
I was very much interested in your article, "Wanted: Improved anchoring method" (*AM*—Dec 2 '57, p105) as I had recently gone through practically the same procedure. My solution is similar to Mr Lee's sketch of "One step forward" in that it also uses a pipe sleeve, but I believe it takes still another step forward.

Instead of welding a bolt in place as done by Mr Lee, I made some oversized nuts out of heavy rectangular machine steel and tapped them for the size of stud bolt required. These oversized nuts—without bolts—were welded to pipes of the required length. Then the stud bolts were made to the desired length and screwed into the nuts.

Before the concrete was poured, these foundation bolts were positioned with a wooden templet and were bolted up tight to the templet. At the bottom, all oversized nuts were welded to hot rolled steel tie rods. As the bolts were fixed in position at both top and bottom, we experienced no movement when the concrete was poured.

When the foundation had cured, the stud bolts were removed easily, and the machine was positioned without any stud bolts sticking up in the way. Also, with the studs in place within the pipe, any machine can be easily hoisted over the studs and lowered down into place. Any slight misalignment will spring the stud into place without damage.

Carl Lauridsen
North East, Penna

Dear Sirs:
The article by H K Lee, "Wanted: Improved anchoring method," sparked an idea.

Can you supply the names of individuals or concerns who might be interested in exploitation of the idea?

J E Lucas
Marietta, Ga

This column is always glad to serve as a clearing house for ideas.

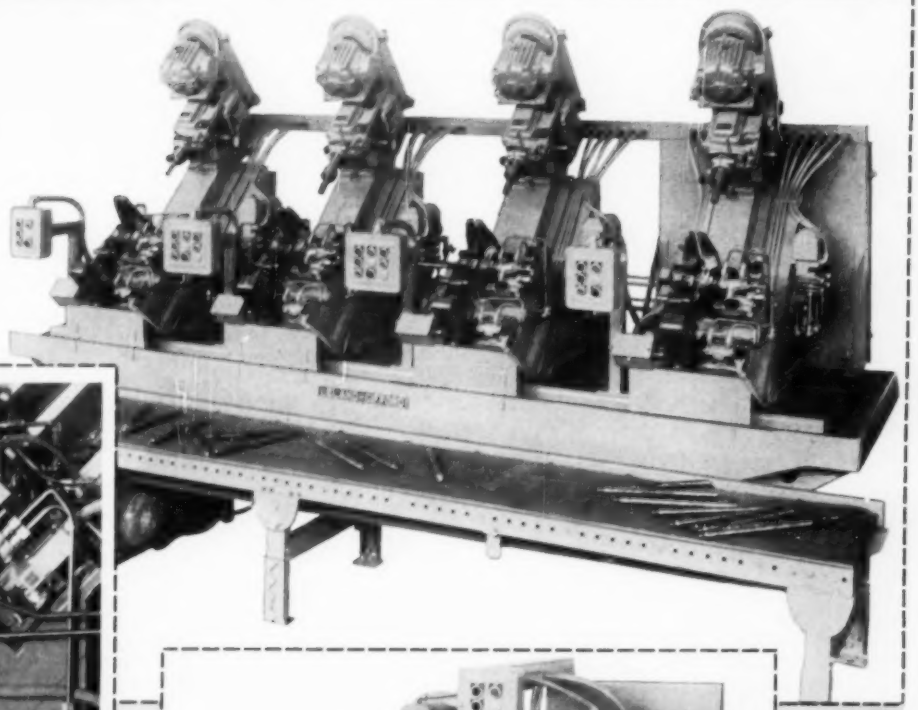
SHOPMATES

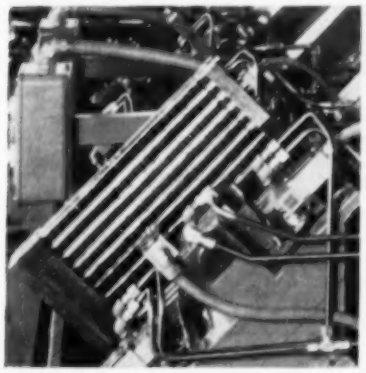
N. Jarvis

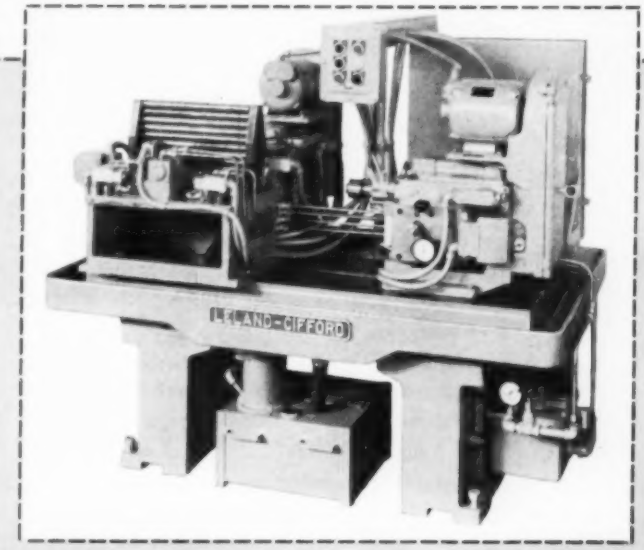
LOOK FRED ···· A FRIENDLY TIP ··· DON'T KILL YERSELF TRYIN' TO FILE THAT OFF,, MILL IT OFF!! THAT'S WHAT MILLS ARE FOR! ETC-ETC··· USE YER BRAINS ···· THAT'S HOW I GOT TO BE STRAW BOSS ···· SAVE TIME ···· SAVE MONEY!!
WHADDYA DOIN'?? DON'T TIE UP A MILL JUST FOR THAT··· FILE IT OFF!! WHY DO YA THINK THEY MAKE FILES FOR?? USE YER HEAD··· GIDDADDA THERE ··· SOMEBODY MIGHT NEED IT !!
BUT··· YOU JUST SAID ···· THREE MIN···
MAKE 'EM PUT IT IN WRITING!! THEY CHANGE THEIR MINDS EVERY MINUTE!!
N. JARVIS

New patterns for profits...

When hand operations are replaced by high speed mechanized methods, you benefit with lower costs, higher production, better quality control. In production drilling, Leland-Gifford is the best source for sound, economical and effective solutions.







STEP 1 ▲

Hopper feed 4-station deep hole drilling unit. Each station automatically loads, positions and drills 3/16″ x 5.860″ hole in automatic transmission part. Discharge to conveyor at 100 pcs. per hour.

STEP 2 ▶

Convey to second unit, drill small cross hole to meet deep hole and ream deep hole. Eject to conveyor at 200 pcs. per hour.

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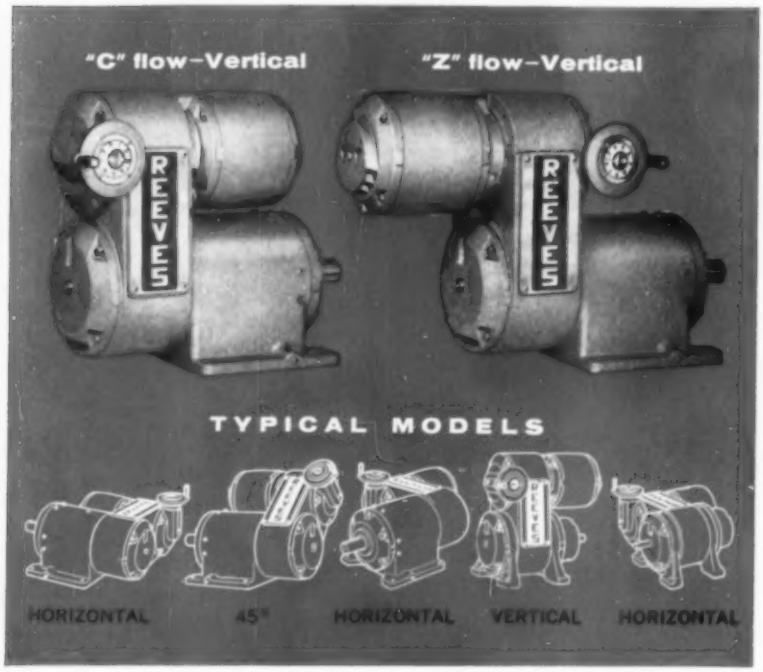
**200-300 Size, 1 through 5 hp.; full line, ¼ through 40 hp.*



The flexible design of these compact new REEVES variable speed power packages permits hundreds of combinations . . . space-saving, space-fitting *standard* assemblies to meet most installation requirements. All models are available in both "C" flow and "Z" flow styles.

New increased capacity is built in the reducers—single, double or triple stages . . . new disc assemblies permit wider output speed ranges . . . discs are pre-aligned . . . pre-loaded spring maintains correct belt tension for longer belt wear . . . *exclusive* "close-grooving" lubrication assures free sliding discs . . . new Metermatic system automatically lubricates the motor and variable shaft bearings.

Complete information on all phases of the versatile 200-300 sizes Vari-Speed Motodrives is given in new Catalog. Write for your free copy today—Dept. A32c-M571.

REEVES PULLEY COMPANY

Division of **RELIANCE** ELECTRIC AND ENGINEERING CO.

Columbus, Indiana

If anybody has another solution to this problem, or wants to follow up on those presented here, just drop us a line—Ed.

Spark-arc hardening

Dear Sirs:

This letter is in reference to your article, "Spark Plus Arc Hardens Steel" (*AM*—Dec 2 '57, p97). The article describes a Soviet-developed process in which hardening of the steel is done on the machine tool using an electrode instead of a cutting tool.

I realize that this material appeared in *American Machinist* to bring a metalworking process worthy of notice to the attention of your readers. However, just to make certain that your readers view this story in its proper perspective and discount its importance as a *primary* technical development, I would like to point out that the operation described seems to be based on an idea I submitted to "Practical Ideas" in 1945 (*AM*—Oct 11 '45, p109).

I described a way to harden the surface of any tool steel job, such as a die or a mandrel, by using a carbon-type soldering iron operated on electric current. When the carbon was held to the cutting edge of the die, the electric current flowing through the carbon tip would cause some penetration of the steel by the carbon from the red-hot tip. The workpiece would harden to R. 58-60 to a depth measurable in thousandths of an inch. We used dies surface-hardened this way on short-run jobs, blanking 0.080-

Helpful Henry

by L. Hoppes

"Here, let me get that banana peeling before someone slips on it and falls."

in mild steel, and we omitted the customary hardening operation.

Edward Diskavich
Torrington, Conn

Well, there is a strong similarity in the general method, but there are some rather wide differences in the details. The main difference is that Reader Diskavich is hardening the base metal by adding carbon to it, whereas the Russians are depositing another metal so that a hard-alloy layer is created—Ed.

CALENDAR

ARMOUR RESEARCH FOUNDATION AND AMERICAN WELDING SOCIETY—Annual Midwest Welding Conference, Jan 29-30, Illinois Institute of Technology (Chemistry Building), Chicago, Ill.

NATIONAL TOOL & DIE MANUFACTURERS ASSOCIATION—Winter Meeting, Feb 5-8, Ambassador Hotel, Los Angeles, Calif.

AMERICAN MACHINE TOOL DISTRIBUTORS ASSOCIATION — Spring Meeting, Mar 10-11, Hotel Roosevelt, New Orleans, La.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS AND AMERICAN ROCKET SOCIETY—Joint Aviation Conference, Mar 17-20, Hotel Statler-Hilton, Dallas, Texas.

SOCIETY OF AUTOMOTIVE ENGINEERS —Production Meeting and Forum, Mar 31-Apr 2, The Drake, Chicago, Ill.

SOCIETY OF AUTOMOTIVE ENGINEERS —Aeronautic Meeting and Display, Apr 8-11, Hotel Commodore, New York, NY.

AMERICAN WELDING SOCIETY — Spring Meeting and Welding Show, Apr 14-18, Statler Hotel, St Louis, Mo.

AMERICAN SOCIETY OF TOOL ENGINEERS—Tool Show, May 1-8 (closed Sunday), Convention Center, Philadelphia, Penna.

NATIONAL TOOL & DIE MANUFACTURERS ASSOCIATION—Spring Meeting, May 3-6, Statler Hotel, Washington, DC.

AMERICAN SOCIETY FOR METALS — Southwestern Metal Exposition and Congress, May 12-16, State Fair Park, Dallas, Texas.

NATIONAL MATERIALS HANDLING EXPOSITION and concurrent ASME conference on Materials Handling, June 9-12, Public Auditorium, Cleveland, Ohio.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Semi-Annual Meeting, June 15-19, Hotel Statler, Detroit, Mich.

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NELCO Cutter Number	TOTAL COST NELCO Solid Tipped Cutter	Replacement Blade Cutter	COST Equivalent Replacement Blade Cutter	COST of set of Replacement Blades*	REMARKS
61045	31.00	A	75.00	18.00*	Cost of Complete do-it-yourself cutter and two sets replacement blades $111.00 + replacement and grinding. Cost 3 NELCO Cutters $93.00.
14112F	140.00	B	336.00	84.00*	Cost of Complete do-it-yourself cutter and two sets of replacement blades $504.00 + replacement and grinding. Cost 3 NELCO Cutters $420.00.
12206-1	50.50	C	116.00	40.48*	Cost of Complete do-it-yourself cutter and one set of replacement blades $156.80 + replacement and grinding. Cost of 2 NELCO Cutters $101.00.
10306-½	37.00	D	129.00	33.12*	Cost of Complete do-it-yourself cutter and three sets of replacement blades $228.36 + replacement and grinding. Cost of 4 NELCO Cutters $148.00.
10108F	86.00	E	292.00	102.58*	Cost of Complete do-it-yourself cutter and four sets of replacement blades $702.32 + replacement and grinding. Cost of 5 NELCO Cutters $430.00.

***Figures above do not include removing old blades, inserting new blades and grinding.**

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At W-K-M Division of A-C-F Industries, Inc., Houston, Texas, Gulfcut Heavy Duty Soluble Oil has been used extensively on turret lathes for threading, boring, facing, turning, and grooving operations. This Gulf customer says: "Gulfcut Heavy Duty Soluble Oil gives us long tool life and excellent finishes."

Erich Brenner, Foreman at W-K-M, informs Jeff Bolling, Gulf Sales Engineer, about the excellent results obtained with Gulfcut Heavy Duty Soluble Oil.

Gulfcut Heavy Duty Soluble Oil

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Here's a completely new emulsifying oil—developed over the past 6 years in Gulf's research laboratories! Gulfcut Heavy Duty Soluble Oil performs efficiently even on low machinability metals. It has a record of proven performance on tough jobs where most soluble cutting oils have trouble meeting requirements.

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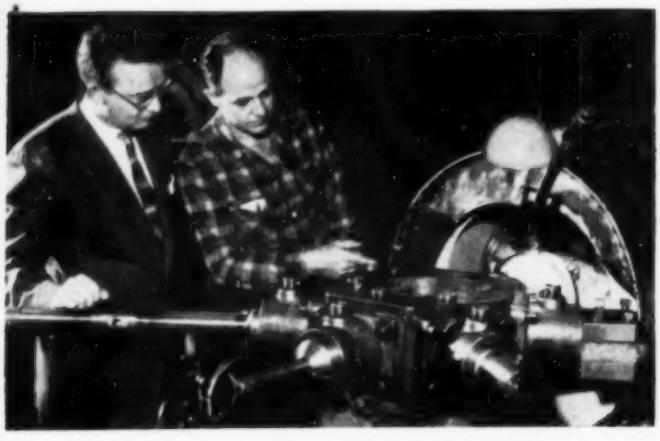

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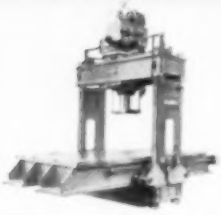

TRAVELING HEAD STRAIGHTENING PRESS — custom-built to meet special requirements.

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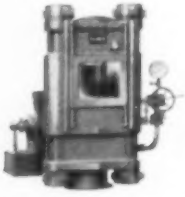

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Spot news...

- **Automatically Positioned Tooling (APT) program** (*AM*—Mar 11 '57, p161; July 15 '57, p133) at MIT under Air Force sponsorship may enable the aircraft (and possibly auto) industry to bypass much of the work now done by aeronautical engineers and draftsmen. Scientists and mathematicians from Convair, Chance-Vought, Douglas, Boeing, North American, Martin, Rohr, Bell and Lockheed, as well as MIT are working on development. Most of the work now is devoted to producing an English-like "language" which can be directly interpreted by the electronic computer-machine tool combination, for use of non-mathematician operators. First unit will be ready early in 1958.
- **Plain grinder capable of grinding parts to a tolerance of 0.000020 in.** (20 millionths) or less, and which mates them to bores to a tolerance of 0.000040 (40 millionths) or less is being offered by an Eastern manufacturer—particularly to rocket and missile producers. Sizing is done electrically from work diameter, with semi-skilled operators.
- **Automotive orders for tooling on 1959 models are beginning to come through** in sizable quantities at last. Because such orders are abnormally late, many tool and die shops in Michigan, Ohio, Indiana and Illinois are planning on overtime.
- **International Association of Machinists is being sued by another union**—Independent United Electrical Workers—for $200,000 libel damages on grounds that four IAM officers circulated a forged letter to Sylvania workers at Mill Hall, Pa, in an attempt to influence an NLRB election.
- **Missiles will exceed 32% of total military aircraft deliveries** by year's end. And they'll make up at least 50% of the total military backlog of unfilled orders. (See Aircraft & Missiles, p87).
- **Employee-suggested plan to get more long weekends** is being tried out at Longren Aircraft, Torrance, Calif. The plan: take the first Monday of each month off, but work the following Saturday. Result: eight three day weekends a year, and four four-day weekends achieved by combining legal holidays with the three-day weekends.
- **Pointing up a new trend in the aircraft industry** (Martin is doing the same thing), Lockheed is shopping around for electronics firms which it can acquire or merge with.
- **Chevrolet will have a new body in 1959,** it's rumored, and Pontiac and Olds, and Buick to a lesser extent, are slated for major changes, too.
- **U S could put a manned aircraft into space within three years,** at a cost of $200 million to $300 million, Aircraft Industries Assn claims. We have most of the hardware and all of the know-how available today, AIA says.
- **Procurement contracts are becoming fewer but larger.** Take the Detroit Ordnance District: in 1956, $225 million worth of contracts involved 2400 separate items; in 1957, $246 million went for 1369 items. Of the 1957 total, $196 million was for missiles and related equipment.
- **Leasing of capital goods is on the increase,** the Foundation for Management Research says, because of three-way pressure of product diversity, expansion and tight money. Leasing, FMR says, will increase most in those industries whose ratio of fixed assets to tangible net worth is greater than 30% (foundries, 48%; machine shops, 44%; stampers, 43%).

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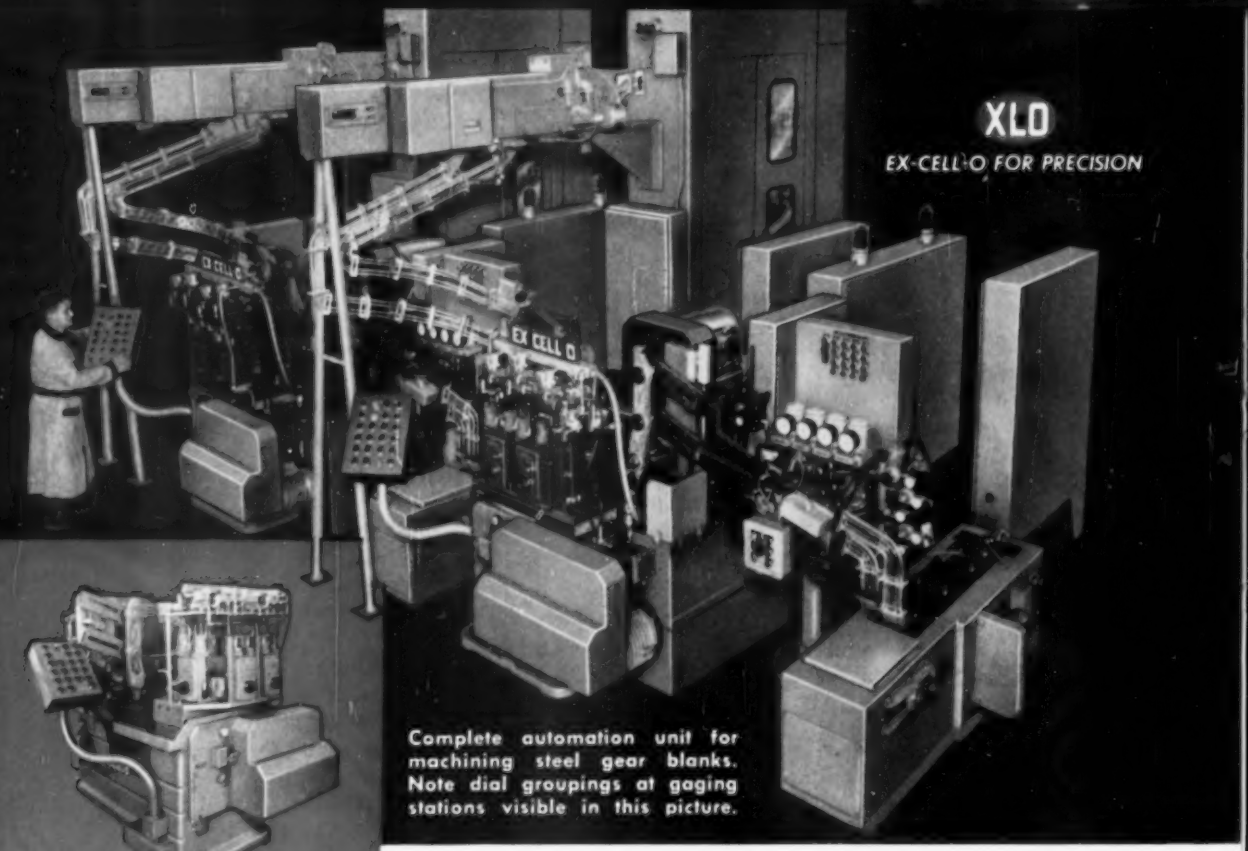
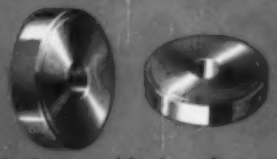
EX-CELL-O FOR PRECISION



Complete automation unit for machining steel gear blanks. Note dial groupings at gaging stations visible in this picture.

Ex-Cell-O Style 312 Cam Boring Machine adapted for automation. Components on cross slide automatically adjust tools to hold specified limits.



Typical gear blanks after automatic machining is completed.

Standard Ex-Cell-O Machines Handle Automatic Operations

Take these cam boring machines, for example: they are standard Ex-Cell-O 312s. When a customer's production schedule called for an unusually high per hour output of steel gear blanks Ex-Cell-O engineers incorporated these machines into an automated setup.

Included in the new setup: two cam-operated Ex-Cell-O Precision Boring Machines, two Gear-O-Mation storage-distribution units, three gaging stations.

The boring machines finish all the surfaces of the gear blanks: face both sides, chamfer both inner and outer edges, bore the central holes and turn the outside diameters. Tools are adjusted automatically to maintain required tolerances. Gage units automatically check parts prior to entering the machining stations, and the storage-distribution units provide space for a bank of parts at each machine station.

If you're interested in automation, but are held back by the high cost of specially designed machine tools, call your nearby Ex-Cell-O Representative today. Perhaps a standard Ex-Cell-O machine tool setup can be adapted to your automatic operation requirements. Or, if you prefer, contact Ex-Cell-O in Detroit directly.

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57-21

Washington ... NEWS REPORT

Big decisions ...

for the metalworking industries are to be made in Washington this year. Not since the Korean War has there been such a sense of crisis and urgency.

In fact, it's the question of how much to do to expand our military preparedness that will dominate the news from now until Congress goes home this fall to run for re-election.

The Democrats want to take Eisenhower and his administration to the woodshed for being in charge when the U S was discovered to be lagging behind the Russians in important areas of military preparedness.

You can be sure of the outcome on the really big issues; some aren't so sure. Here's a rundown of most of them:

Military spending will be increased, and appropriations—that is, the military's authority to make long-term contracts—will go up even more.

Missiles spending will show the biggest percentage increase, and most of the increase will go to the long-range ballistic missiles (see p87).

Manned aircraft spending will be sliding some, overall. Fighters will be hit the most; bomber spending will stay steady or even increase a bit.

Conventional weapons will benefit from some research and development, but orders for production will be cut.

Navy will benefit in some ways from the new look that's being given our military defenses. One thing is sure: atomic submarines are the Navy's weapon of the future. A sub fleet is to be built to become a world-wide launching platform for intermediate range missiles.

Navy's Polaris IRBM, made by Lockheed and Aerojet, is reckoned as the most technically advanced IRBM. It's the only one with a solid fuel, and the experts agree that solid fuel is what these weapons will have to come to eventually.

The atomic super-carrier may have had its day before it is even launched. Navy has one under construction, but it was not able to get authorization for beginning another out of the new budget. Some experts guess that not another such super-carrier will ever be built.

Offsetting higher military orders will be the attempt by some administration figures to cut back on civilian spending programs as a way of paying for the increases in military spending. But Congressmen and Senators from both parties are already bucking at holding down on dams, flood control, health and other services and programs that their constituents have come to expect from Washington.

Aid to scientific education is sure to be voted, with hundreds of millions spent each year. The President's program would put a billion of federal funds in scholarships, teachers' salaries, expanding laboratory equipment and the like over a four-year period.

No tax cut ...

A tax cut is out in view of the precarious balance of the big new budget. Spending is up and income prospects are looking poorer as business declines. The administration has to have a higher debt ceiling to accommodate more borrowing to pay the government's bigger bills.

A significant business slide isn't expected. Washington's economists are practically unanimous in predicting an upturn by mid-year. But if the recession grows instead of fading away, then the administration would back a tax cut. But the Federal Reserve Board would be sure to pump up supplies of credit long before tax cut talk becomes very meaningful.

Labor legislation to regulate unions and their financial operations seems out of the question despite the publicity unions got last year. The fuss over Reuther, the Auto Workers, and the Kohler strike will evaporate chances for a nonpartisan support of legislation.

Atomic energy equipment makers should get a boost out of the drive to put more federal money into the atomic power field. Up to now, private utilities have been having trouble providing enough capital to keep the infant atomic power industry growing.

Reciprocal trade law will be extended, but with the current softness in business, industry demands for more protection from imports will be given more of a hearing in Congress. More restrictions on the administration's ability to negotiate lower rates are sure to be part of any extension.

Patent law hearings are likely, aimed at piecemeal tinkering with the law. But any new legislation seems out.

Basic research programs, both inside federal agencies and in grants to outside researchers, will be stepped up. The National Science Foundation, National Institute of Health, National Bureau of Standards and the like should all get more money.

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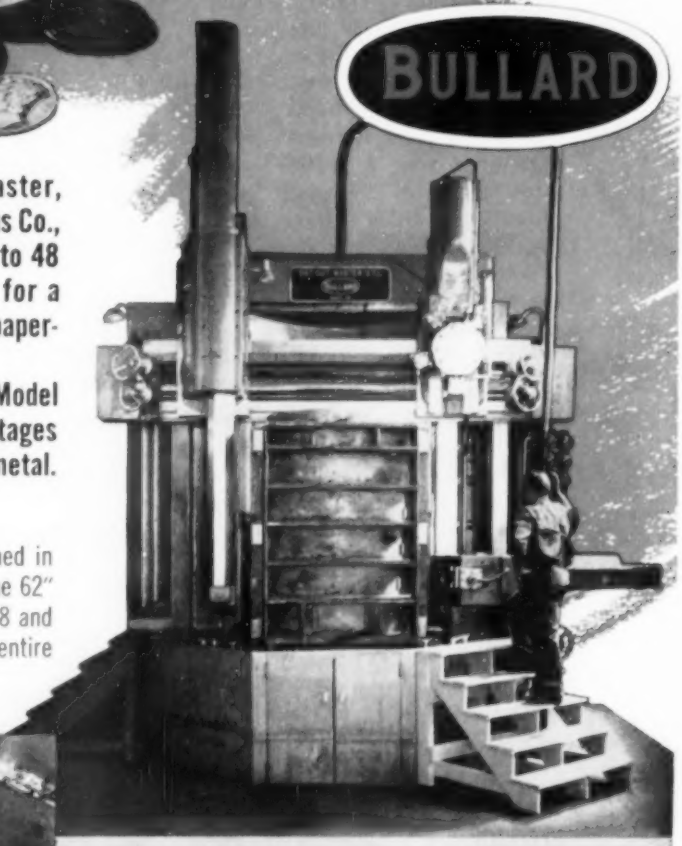

The new 66" Bullard Cut Master, Model 75 purchased by E.D. Jones & Sons Co., Pittsfield, Mass., has reduced from 65 to 48 hours the machining time required for a 4,000 lb. stainless steel piece used in a paper-making machine.

The Bullard Cut Master V.T.L., Model 75 line offers many features and advantages to help you — cut costs when cutting metal.

The part, 68" high, formerly had to be machined in three operations. Now, with an extension on the 62" Ram, a table speed of 9.6 r.p.m., feed of .0208 and 1/8" depth of cut, it is possible to machine the entire depth in one operation.

Close-up showing step boring and facing operation with 370 grade carboloy tool.

Complete details are available from your nearest Bullard Sales Office or Distributor or write

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BRIDGEPORT 9, CONNECTICUT

Detroit ...

Cautious optimism for 1958...

The traditional year-end statements from GM, Ford, and Chrysler were notably frank this time in pointing to the problem and pinpointing its cause.

The problem, of course, is slow auto sales, which by one company's estimate are currently running at an annual rate of 5½ million units exclusive of imports. Even more pessimistically, authoritative *Ward's Automotive Reports* predicts 1958 passenger car production, again exclusive of imports, at 5.3-million units.

As for cause, GM President Harlow Curtice says: "As we try to look ahead, an all-important factor in the business picture is confidence—confidence on the part of both business and the consumer. For various reasons, confidence at present seems to be somewhat shaken and an attitude of caution appears to prevail. This can have a substantial effect on the level of economic activity."

Ford Economist George Hitchings, speaking of 1958, says: "Business and consumer spending are the questionable segments. Consumers played a key role in the 1953-54 decline by maintaining their spending in the last half of 1953 and increasing it throughout 1954. Maintenance of consumer spending is again essential during the present declining phase of the economy."

He continues: "In the auto industry, we expect to have below-normal years when total business activity temporarily declines, but we also expect to follow such years with above-normal years. The long-run outlook is not changed as a result of a slowing down in one year. The auto market is sensitive to shifts in consumer incomes and psychology, however, and we are concerned lest these shifts be allowed to proceed too far."

Chrysler President L L Colbert finds solace in pointing to the fact that in the 7.2-million car year of 1955, 2.5-million cars sold on installment credit carried 30-36 month contracts, which will be paid up in 1958. But the potential for a good year, he says, "depends upon how quickly the nation's economy can adjust to the present downturn or leveling off in some sectors of business activity."

For every baby a car is born...

It is actually hard for Detroit to stir up any real pessimism for the long pull. Favorite statistic is the Census Bureau estimate that the nation's population may reach 200 million by 1967. Then there's the trend to the suburbs, which are growing at the rate of seven persons for every two that move to city or farm. Suburbia, Detroit reasons, cannot get along without at least two cars per family, and backs this with figures showing that cars owned by multiple-car families increased from 3 million in 1948 to more than 13 million in 1957.

Split decision...

For prestige reasons, Ford and Chevrolet in a close sales year fight a war with billboards, posters, and the like over which was first in the sales race.

In 1954, the public was confused by overlapping claims. Ford said it had more registrations. Chevrolet countered with figures purporting to show more sales. Then someone tossed in a "first in production," to be countered by figures that included trucks.

This year the two are at it again. Ford says it "built and sold more cars for domestic use in 1957 than any other single manufacturer." Its produced total, not all sold, was 1,490,435 units. The Ford release went on to peg Chevrolet production at 1,479,718, using "published figures that were available."

A Chevrolet spokesman, when called, admitted that he was busy preparing a release that showed a production total for his company of 1,522,538, but this figure includes exports.

As usual, no one will know the true results until the fight is forgotten.

Breaking the hp resolution...

Despite their pious resolution of last June banning emphasis on speed and horsepower, automakers have produced a bumper crop of hot rods for 1958. The last of the stable were introduced at the Chicago Auto Show.

Ford showed its neat, four-passenger Thunderbird in hardtop form—with a promise of a convertible by spring. Costing $30 million to tool, the car is all-welded, unit-body construction by Budd. Tentative production schedules call for doubling volume to 35,000 a year.

De Soto is offering the third limited edition of its Adventurer, a 345-hp car with special trim. Contrary to earlier predictions, Bendix electronic fuel injection will not be an option.

Mercury, already recognized as the nation's horsepower leader (400 hp), has taken the opposite tack by reviving its economy Medalist. This car had accounted for 16,000 units of Mercury production when it was abandoned for no apparent reason in 1956.

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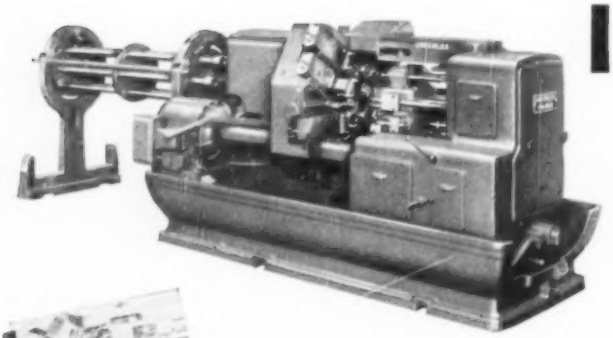

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SECOND-OPERATION
PNEUMATIC STOCK FEED

WRITE TODAY FOR CATALOG A-405

PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1721 Mason Avenue
Rockford, Illinois

Aircraft and Missiles...

NEWS REPORT

New orders begin to flow . . .

The volume of new military contract awards for aircraft and missile production is on the rise. Two factors are involved: (1) relaxation of defense budget restrictions which have delayed placement of new orders in the past six months; and (2) acceleration of the Ballistic Missile Program.

The Pentagon now estimates that about $7.3 billion worth of new contract awards for aircraft and over $3 billion for missile production will be let during fiscal 1958, ending June 30.

This is slightly more than the value of aircraft and missile awards made in fiscal 1957. You get some idea of how new orders have been delayed recently from these figures: only $2.8 billion worth of contracts for all military hard goods procurement—mainly for plane and missile output—was placed during July-October 1957. But in the same period in 1956, $4.6 billion worth of new orders was placed.

The outlook for new orders in fiscal 1959, starting next July 1, is for a drop in aircraft and a sharp boost for missile production awards. Actually, the Pentagon is likely to push through many of these new missile contracts before the current fiscal year ends. In this case, new missile orders could hit close to $4 billion for fiscal 1958 alone.

Outlook for military deliveries . . .

Military expenditures—that is, shipments—for aircraft will total about $7.1 billion in fiscal 1958—down from last year's $8-billion volume; for missiles, close to $3 billion—compared to $2 billion last year.

In fiscal 1959, the total for aircraft is slated to dip at least $750 million. Missile spending, however, is expected to hit $4 billion; of this sum, at least $1.5 billion is earmarked for the Atlas and Martin ICBM and Thor, Jupiter, and Polaris IRBM projects.

Industry review of the year . . .

Aircraft industry sales for 1957 totalled $11.5 billion, according to the Aircraft Industries Assn. This is a $2-billion boost over 1956. Still, industry employment dropped by 100,000 to a total of 800,000.

Output of military planes dropped from 6800 units in 1956 to slightly more than 5000 in 1957. Increased production of missiles and stepped-up delivery of commercial planes, however, offset the cut in military aircraft production. Commercial sales went over $2 billion for the first time in industry history, $500 million above the 1956 sum.

During 1957, the military take of aircraft industry output amounted to 82%, compared to 85% in 1956 and 89% in 1955. But still there was a decline in unit deliveries of commercial planes—6850 planes in 1957, compared to 7205 in 1956. At the same time, however, dollar value of commercial aircraft shipments rose from $454 million to $725 million.

During the first nine months of the year, the 12 major airframe producers reported an increase in sales of more than $1 billion from the 1956 figure of $3.8 billion. Earnings rose from $112.6 million to $120.1 million. Rate of earnings to sales, however, dropped from 2.9% to 2.4%.

At the end of September 1957, the industry backlog of unfilled orders amounted to $14.4 billion—$4 billion under the figure for the preceding year. About $3.8 billion, or 36%, of the backlog was for commercial orders.

Outlook for 1958 . . .

Overall aircraft sales will run well over $10 billion. Continuing declines in shipments of military planes will be offset by increased deliveries of missiles and commercial aircraft, including the first shipments of turbojet and propjet transports. By the end of the year, missiles are expected to exceed 35% of total military deliveries and to make up at least half the total military backlog of unfilled orders.

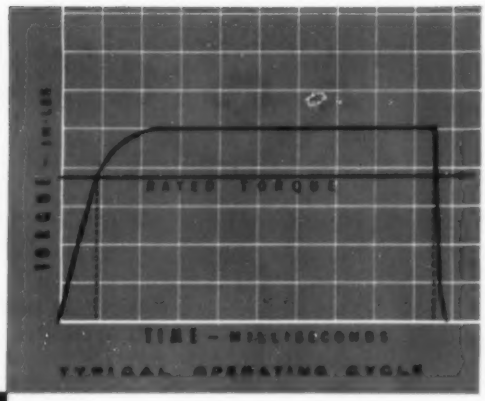
Industry employment will continue to drop well below the 800,000 level, and additional production facilities are expected to shut down.

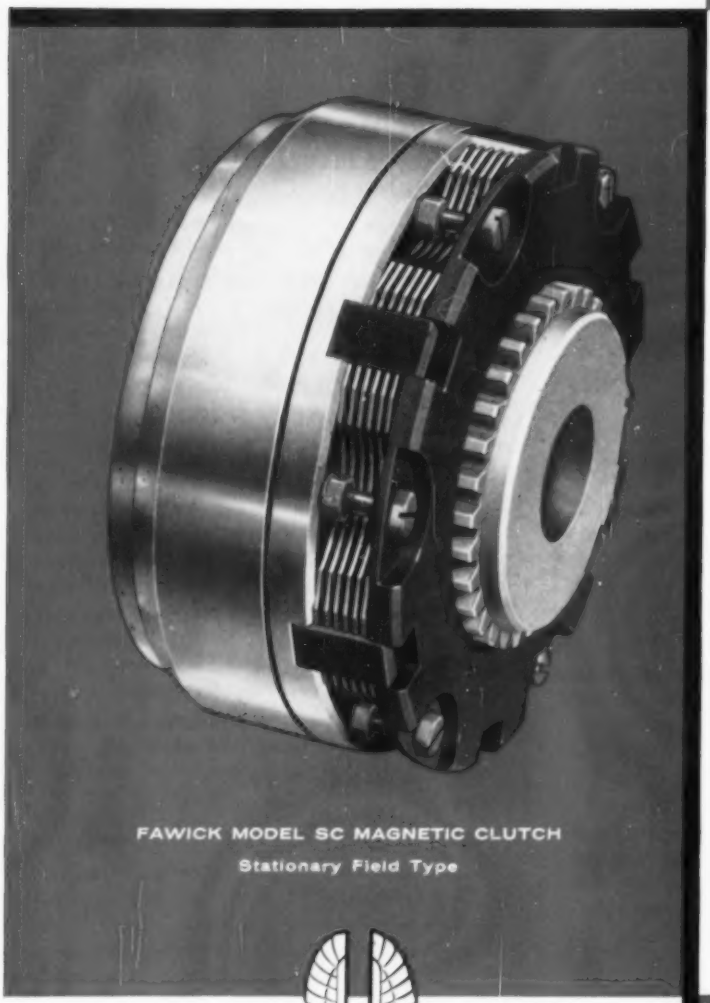
Clash of views on small business . . .

The Pentagon says that small contractors received at least $3.5 billion in military subcontract work and $3.8 billion in direct contract awards during fiscal 1957—roughly 20% of military procurement. Over two-thirds of military hard goods production goes for missiles and planes.

The Pentagon's official announcement on the small business share was made in a tone of achievement. But the Senate Small Business Committee charges "lethargy, inaction and procrastination" hampered the program. The Air Force, in particular, was singled out for criticism. It said the Air Force failed to determine the impact of recent production stretchouts and cutbacks on small subcontractors.

THE *FASTEST* ELECTRIC CLUTCH IS FAWICK MAGNETIC





FAWICK MODEL SC MAGNETIC CLUTCH
Stationary Field Type

■ Manufacturers and users of machine tools can speed up performance and shorten operating cycles with FAWICK Magnetic — the fastest-acting electric clutches and brakes available.

FAWICK'S patented design produces a faster "decay time" and eliminates "residual drag". Engagement is not only quicker but also smooth and shock-free. Response to controls is instantaneous with full power transmitted immediately.

Add this fast action of FAWICK Magnetics to their other outstanding advantages and you have "the world's finest electric clutch". And they are available at no extra cost.

FAWICK Magnetic Clutches and Brakes range in size from 2 to 13-inch diameters with torque ratings from 36 to 48,000 in-lbs. For further information, write the Home Office, Cleveland, Ohio for Bulletin M-101 or contact your nearest FAWICK representative.

Representatives in Principal Cities

FAWICK Magnetic
INDUSTRIAL CLUTCHES AND BRAKES

FAWICK AIRFLEX DIVISION
FAWICK CORPORATION
9919 CLINTON RD. • CLEVELAND 11, O.
In Canada, Fawick Canada, LTD., Toronto

NEWS REPORT

Machine tools ...

More government tools on market ...

The number of surplus government-owned machine tools destined for public disposal is rising.

Some 11,000 of them were declared excess in fiscal 1957 (ended last June 30) by the armed services. Of that total, some 1400 were taken by other government agencies, mostly by the General Services Administration for the National Industrial Equipment Reserve.

The disposal rate is expected to go up about 1000 units each year over the next two years.

That in itself may not seem like much of an increase. But the point is that from now on the ratio of general-purpose machines to the total offering will be much higher. More than that, the surplus machines will be of more recent design.

Some of them will be equipment no longer needed for military production because the end items produced are obsolete.

Up to now the armed services have been offering a high proportion of tools fit mostly for the scrap heap. A lot of special, single-purpose machines were included.

ODM has plans ...

To lessen any impact on the machine tool market stemming from increased surpluses. Office of Defense Mobilization is considering two plans.

One is to offer surplus equipment to schools before it is put up for public sale (*AM*—Dec 16 '57, p97). Schools now have a "second priority," as one official puts it, to take a look at surplus machines. Foreign governments, in fact, frequently are able to secure surplus tools before U S schools can.

Schools would be given top priority under the new plan. Training thus would be provided for young men wishing to become skilled metalworking technicians.

The second plan is to enlarge the National Industrial Equipment Reserve to include machines for use in reconstruction of the civilian economy after a nuclear attack. Such machines would be stored underground in abandoned mines and caves.

Brown & Sharpe acquires Double A...

Browne & Sharpe Mfg Co has acquired the Double A Products Co, Manchester, Mich, as a wholly-owned subsidiary. Double A makes a wide line of commercial hydraulic control valves used extensively in automated machine tools and heavy capital equipment of many types. Brown & Sharpe builds gear, centrifugal and vane pumps in its Hydraulic Products Division.

Merger of the two companies is expected to result in new and broader hydraulic product lines and wider channels of distribution. All Double A assets are being transferred to a new Brown & Sharpe Michigan subsidiary. Location of manufacturing operations will stay unchanged.

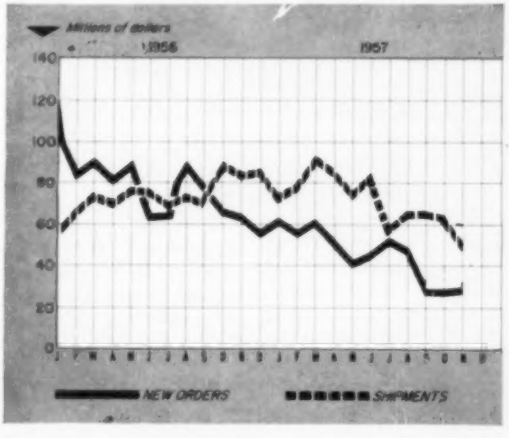
Cleveland Hobbing to Textron ...

Textron Inc, which used to be a textile company and in recent years has diversified into many industrial lines, is entering the machine tool building field through acquisition of the Fanner Mfg Co, Cleveland, of which Cleveland Hobbing Machine Co is a division.

From here on, Cleveland Hobbing Machine will be operated as a separate division of Textron with Howard J Findley continuing in charge as division president.

Chinese visit British plants ...

A Chinese economic and technical mission visited recently more than 150 British companies, 50 trade and production research institutions, and six universities. Delegates went to several British machine tool builders, their interest being mainly in high production machines.



For the first time since July, new orders for machine tools rose slightly—from $27.8 million in October to $28.4 million in November, on the National Machine Tool Builders' Association Index. But shipments continued to fall off—from $60.9 million in October to $47.4 million in November. Backlogs declined slightly during the same period—3.5 to 3.3 months

ND FACTS

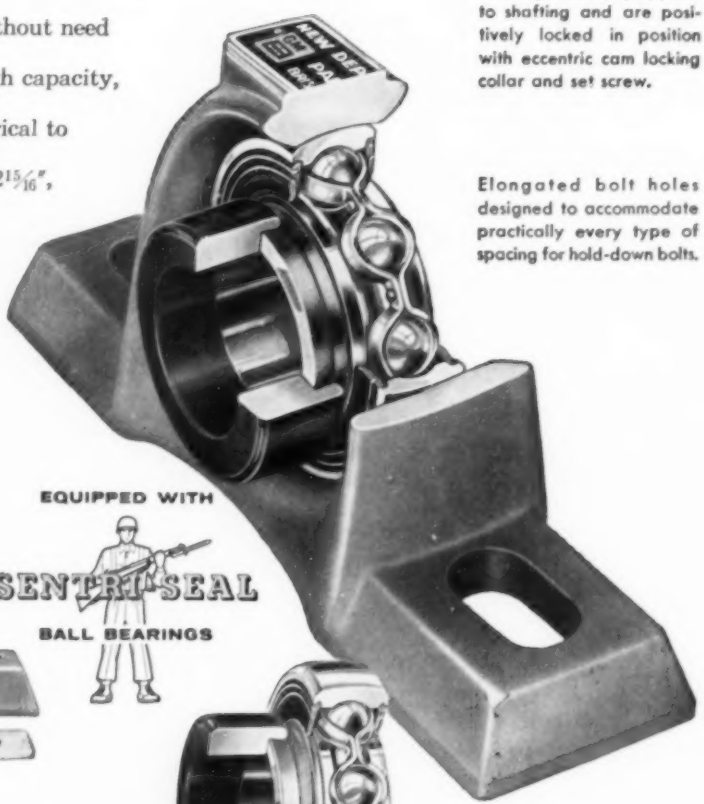
NEW DEPARTURE PILLOW BLOCKS— BUILT FOR LOWEST MAINTENANCE

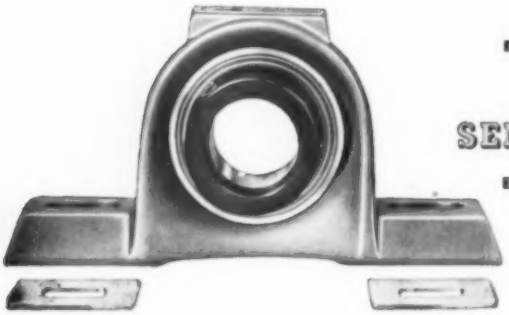
- New Departure adapter ball bearings are sealed and lubricated for life.
- Design is compact and rigid—fits easily in limited space.
- No grease nipples or other protruding lubricating fixtures needed.
- Pillow blocks are easily mounted without need for any special tools.
- New Departure ball bearings are high capacity, precision-built for long life.
- Bearing and block surfaces are spherical to accommodate any misalignment.
- Thirty-two shaft sizes, $\frac{1}{2}$" through $2\frac{15}{16}$", for wide variety of applications.
- Interchangeable with most other makes of pillow blocks.

Bearings are easily applied to shafting and are positively locked in position with eccentric cam locking collar and set screw.

Elongated bolt holes designed to accommodate practically every type of spacing for hold-down bolts.

Mounting pads are furnished with each New Departure Pillow Block to assure easy interchangeability with all pillow blocks having a high base-to-center dimension.





EQUIPPED WITH

BALL BEARINGS

New Departure Pillow Blocks employ performance-proved Type AE adapter ball bearing with Sentri-Seals for long-life protection against dirt or grease leakage.

Send for Catalog PBC

1908–1958 GM FORWARD FROM FIFTY

NEW DEPARTURE

DIVISION OF GENERAL MOTORS, BRISTOL, CONN.

NOTHING ROLLS LIKE A BALL

What's ahead ... in Metalworking

NEWS REPORT

Output to be high, but down from last year . . .

Metalworking operations in the first quarter will be high, but will be well below the volume produced in the like quarter of last year.

There will be few if any exceptions to this downtrend. Nevertheless some segments of Metalworking are sufficiently good that they will offset much of the decline in other segments.

The outlook in home appliances, for one, is pretty good. Chances are better than even for a modest gain over 1957. The same situation holds in residential construction.

Electrical goods demand is active . . .

Sales by the electrical manufacturing people will be bolstered this year by backlogs and further orders from public utilities for heavy electrical generating equipment and for distribution equipment.

It is the capital goods industries that are dragging down metalworking production. The progressive downturn in new orders over many months is now being sharply felt in curtailed output.

The sag in production applies to industrial machinery of almost all kinds. It is especially acute in metal-cutting machine tools.

New orders for industrial furnaces in the first 11 months of 1957 were down 31% from the previous year, Industrial Heating Equipment Association reports.

Farm machinery outlook fair . . .

Farm implement demand is just fair and no change for better or worse is expected soon. Road machinery builders continue to be plagued by excessive inventories that keep output levels down.

Diesel-electric locomotive production has declined steadily over many months and now is at the lowest point in several years.

Total steel use this year promises to be down from the record pace in 1957. Of greater significance, steel inventory cutting will be maintained well into the year, acting as a restraining influence upon steel production. Top steel men estimate that in recent months steel shipments to users have fallen about 10% below actual consumption.

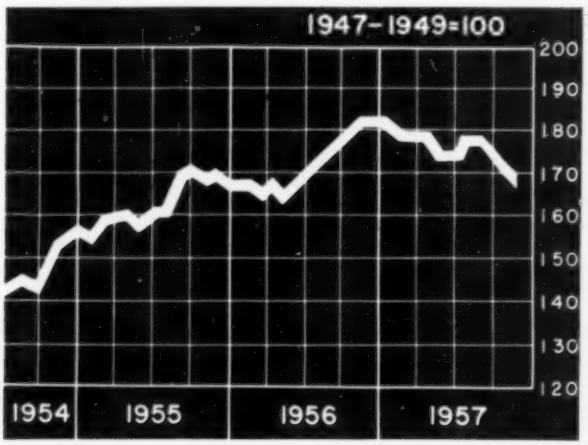
Brass mills expect to go along for some weeks at about the same reduced pace that has held in recent weeks. They have little hope that the year as a whole will quite come up to 1957.

Material handlers optimistic . . .

Material handling equipment industry anticipates that 1958 sales will at least equal the 1957 volume and may be up as much as 5%. Last half of the year promises to be better than the first half. The industry is counting on relaxation of the "let's wait" policy of the policy-making groups in metalworking managements.

Aircraft industry is confident that its output this year will top the $10-billion mark. Increased delivery of guided missiles and of commercial planes, including first delivery of turbojet and propjet transports, will offset the decline in production of military planes.

Unfilled orders for guided missiles will comprise at least half the total military backlog of plane makers by the end of 1958. Employment is expected to drop below the 800,000 level.



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AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

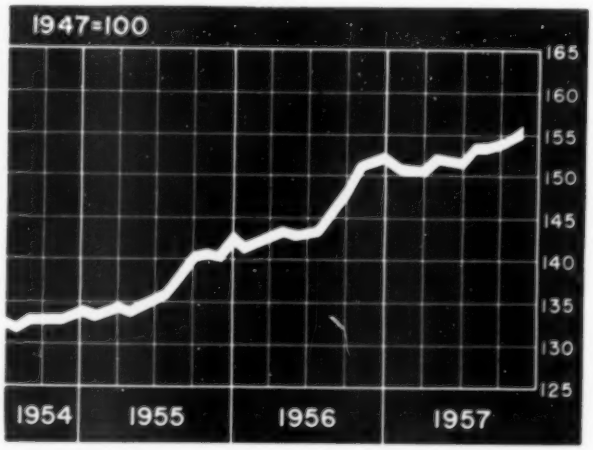
	DEC. Esti-mated	NOV. Pre-liminary	OCT. Re-vised	NOV. Year Ago
Total Index	**167**	**168**	**169**	**180**
Machinery	141	146	155	
Electrical Machinery	198	194	219	
Autos	154	118	151	
Other Transportation	289	346	330	
Other Metalworking	143	142	144	

NEWS REPORT

What's ahead:...in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	DEC. Estimated	NOV. Preliminary	OCT. Revised	NOV. Year Ago
Total Index	**156.0**	**155.8**	**154.7**	**150.8**
Metalworking Machinery	**183.8**	**182.4**	**174.1**	
Other Machinery exc. Electrical	**165.8**	**165.1**	**158.5**	
Electrical Machinery	**156.9**	**156.9**	**151.2**	
Fabricated Metal Products	**145.7**	**144.9**	**143.3**	



Second half should mark an upturn...

No general business upturn, economists and businessmen are pretty much agreed, can be expected before the middle of the year.

One reason for this is that lower employment and shorter workweeks in such key industries as aircraft and automotive are reflected in personal incomes, and this in turn affects consumer buying and business in general.

When and if anticipated spring surges in car buying occur, and when firm orders for aircraft and missiles begin to come through, it will still take time to bring employment, incomes and consumer spending back to year-ago levels.

But businessmen and economists are agreed, too, that long-run expansion forces and the floor under our growing national economy are as strong as ever. And that means the current leveling-off, recession or call it what you will, is purely of limited duration.

As we go into 1958, it looks as though the U S economy will produce just as much goods and services as it did in 1957, which despite a general **falling-off toward its end, was one of** the really great years for U S business.

This year is expected to reverse 1957's economic trend. Gross National Product, which was operating **at an annual rate of $440 billion** at year's end, will drop off to about $438 billion until the second half of this year, when it is expected to forge ahead at an annual rate of $441 billion.

And 1958 is expected to be the year in which prices will finally cease their rapidly spiralling climb. There is already some evidence of this, and as unemployment and lessened consumer buying take their toll, prices should at least level off and possibly decline. Wholesale prices, which are usually an indication of retail price fluctuations, have already begun to drop.

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	135.3	136.6	153.0
Steel ingot operation (thousands of tons)	1,510	1,366	2,490
Electric power output (million Kilowatt hours)	N.A.	12,412	11,196
Production of automobiles and trucks	95,249	171,434	119,276
Engineering construction awards (Eng. News-Record—millions)	$259.3	$273.8	$323.7

MONTHLY BUSINESS INDICATORS	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949=100)*	139	141	146
Index of durable manufactures production (1947-1949=100)*	153	154	165
Durable goods manufacturers' sales, millions*	$14,193	$13,692	$13,261
Machinery manufacturers' sales, millions*	$ 4,120	$ 3,945	$ 3,472
Durable goods manufacturers' new orders, millions	$14,535	$14,266	$14,094
Machinery manufacturers' new orders, millions	$ 4,354	$ 4,200	$ 3,929
New orders for non-electrical machinery (1950=100)*	120	125	147
New contracts for industrial construction (1950=100)*	103	117	220

* Seasonally adjusted
N.A. Not Available

WHAT'S AHEAD...

in steel service and supply

New Steels—1958 will peak 1957 by the addition of scores of new sizes and types of steel. Stocked for ready shipment from strategically located Ryerson plants are such new products as:

- **Pre-painted Steel** . . . cold-rolled coils, in color choices, widths from ¾" to 42", gauges .006" to .035".
- **New Tubing** . . . hot finished carbon steel in wall thicknesses up to 1½", O.D. sizes up to 12¾".
- **Alloy Rebars** . . . reinforcing steel with high-yield point for space saving.
- **Alloy Plates** . . . hot rolled 8620 in 16 sizes, and hot rolled annealed 4140 in 19 sizes, thicknesses up to 5", widths up to 84".

These represent only a sample of the many additions in stock . . . and coming during 1958.

New Quality Safeguards—Already known for controls that protect you on every purchase, Ryerson is further revising and tightening its quality control program across the entire range of products. For example, new closer cutting tolerances are being established; specifications are being reviewed, and all phases of Ryerson service are being more exactly tailored to your needs.

Stepped-Up Service—To meet growing demand, new Ryerson plants have just been opened at Indianapolis and Charlotte . . . modernization and expansion programs are completed or under way at Los Angeles, Pittsburgh, St. Louis, Buffalo and Spokane.

1958 promises steel users further improvements in Ryerson plants and facilities. Delivery records, such as shipping five out of every six orders within 24 hours, and 60-minute emergency order handling will continue to assure you of getting exactly what you need *when* you need it.

As close as your telephone, you'll find a wider range of steel stocks . . . controlled high quality . . . dependable service that goes beyond the material itself. So, as you look ahead into 1958, it will pay you to include Ryerson in your plans.

RYERSON CERTIFIED QUALITY

RYERSON STEEL

Member of the PLANET Steel Family

Principal Products: Carbon, alloy and stainless steel—bars, structurals, plates, sheets, tubing—aluminum, industrial plastics, metalworking machinery, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE • CINCINNATI • CLEVELAND DETROIT • PITTSBURGH • BUFFALO • INDIANAPOLIS • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

Cuts die-grinding time 20%

WITH ROTOR'S 40,000 RPM BLADED TYPE TOOL

JOB: Die grinding. Formerly used bulky turbine type air grinders. Power dropped under load. Switched to Rotor D-03 Pencil Air Grinder.

RESULTS: Bladed type motor of Rotor D-03 cut job time 20% because of its ability to deliver higher speed under load. Tool paid for itself in 8 weeks. Also, tool is lighter, more compact . . . easier to handle, more versatile. Full details in Bulletin 42A.

Have a Rotor Application Engineer study all of your portable tool operations for possible savings. No obligation.

ROTOR TOOLS
CLEVELAND, OHIO

Here's the RIGHT TOOL for YOUR job!

Rotor Air Tools: Assembly Tools • Drills • Small Wheel Grinders
Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers
Rotor High-Cycle Electric Tools: Grinders • Polishers • Sanders

American Machinist
MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

What You Can Do For Your Schools

While we are engrossed in the problem of teaching more youngsters more mathematics, more physics and more engineering, we should not forget to put our attention on another important educational matter—training skilled factory workers and technicians for the new age of automation.

Not every teenager . . .

gets to college. Not every teenager is mentally equipped for higher education. Not every teenager is cut out to be a business executive, a professional man or even a white-collar worker.

What of it? There is a crying need, which is likely to persist indefinitely, for good mechanically-trained men. The demand for highly skilled shop men and technicians (as distinguished from graduate engineers) promises to increase rather than decrease as industry mechanizes further.

There is no denying the shortage of physical facilities and of teachers to take care of our rapidly growing school population. All of us are aware of the good that can be done by providing more scholarships in our institutions of higher learning. But at the same time let's remember that a great need exists for down-to-earth vocational schools and two-year community colleges.

Just to have these schools . . .

in existence is not enough. They can be good, bad or indifferent. Unless they are very good, they will not be fulfilling their real function.

Whether it be a vocational school or a community college, it will be only as good as its teachers. They should be the best obtainable for the money. They should possess the teaching skill and the enthusiasm for teaching that fires the interest and commands the respect of the youngsters.

The proper physical equipment and textbooks should be available. There is no use learning about today's shop problems and how to master them with yesterday's tools.

It is the graduates of these local schools that are going to provide you with skilled shop men and technicians tomorrow. Nothing in the educational world is more important than for you to give wholehearted and continuing support to these schools.

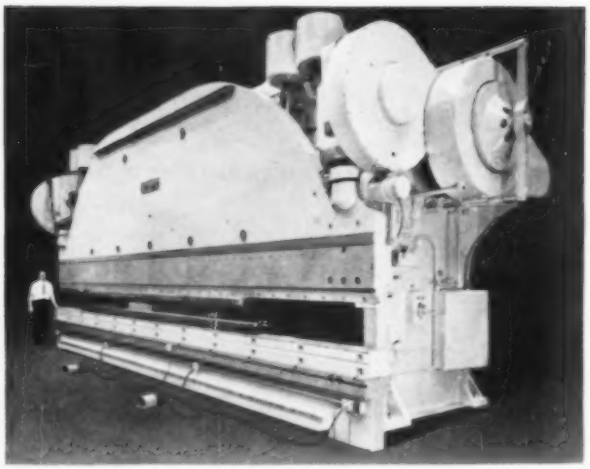
While you are pouring out dollars . . .

for scholarships in universities—a most commendable action on your part—you cannot do better than to put some of your available funds to work supporting vocational education at the local level.

More than that, you can give of your time and energy to know and be the friend and counselor of the faculties of these schools. They get precious little help and sympathy as it is. They could use plenty more.

This kind of community service to education deserves your unflagging interest. Its practical value to you, your neighbors and the schools themselves cannot be overestimated.

Burnham Finney EDITOR



How press brake construction affects job costs

Only accurate machines can make accurate bends. The accuracy obtainable from a press brake begins with its structural rigidity. Cincinnati Press Brakes give you maximum accuracy and rigidity because of these construction features:

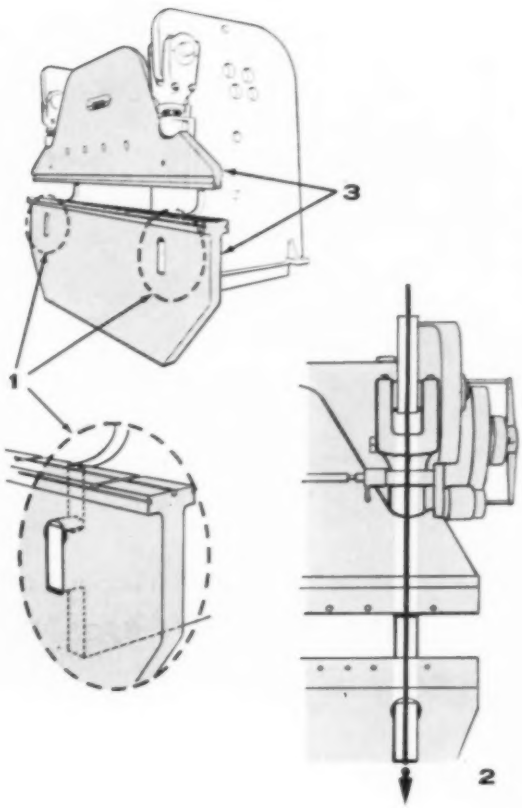
1. Interlocked construction—The bed is supported directly by the housings, by means of hand-scraped bearing shoes. No welds are used as load supports, so every Cincinnati is free from welding strains.

2. Center line loading—Since the Pitmans which drive the ram *straddle* the housings, weaving of the frame and cramping of the ram slides and shaft bearings is eliminated. All operating forces are contained within the housings.

3. Deep beds and rams—It's a simple engineering fact that the rigidity of a press brake's ram and bed increases approximately as the cube of the depth. For this reason, most of the weight of the ram and bed of a Cincinnati Press Brake is disposed in depth, rather than thickness. Tests prove their working surfaces remain parallel within .005" under capacity loads.

To you these construction features mean money saved in the long run. A Cincinnati Press Brake is more accurate than other makes when you buy it . . . and will stay that way throughout its long life.

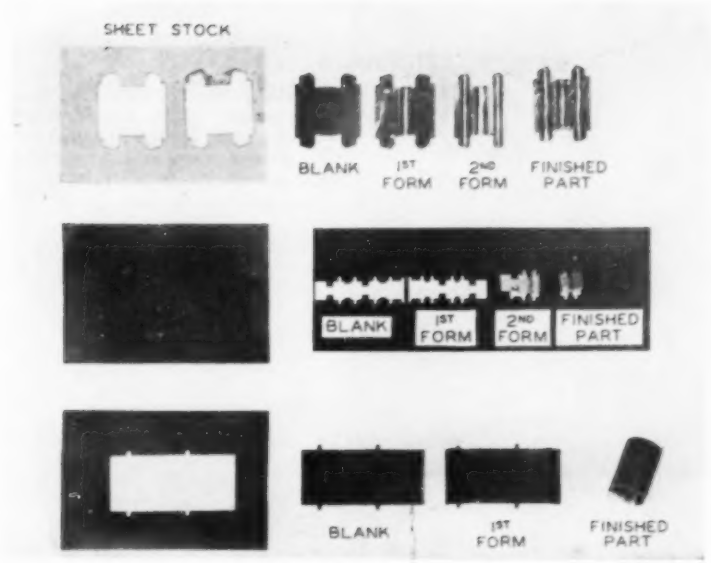
Write department A for Catalog B-5.



Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio



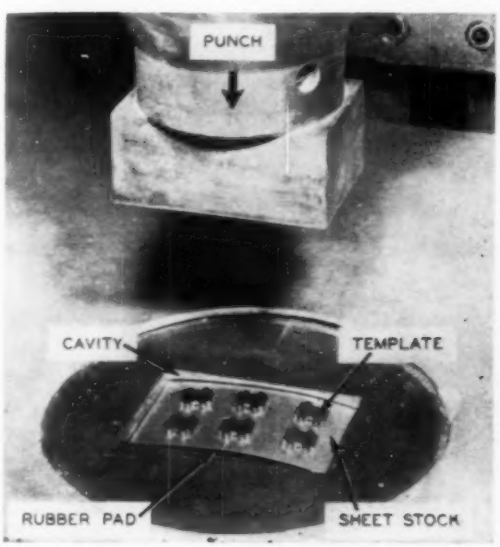
Progressive stages . . . from a flat sheet to a typical finished formed part. Usually, rubber-die blanking is most economical to accomplish the first step (extreme left). For simple shapes, nibbling can be used to produce the outline

American Machinist

Simple shop practices for short runs

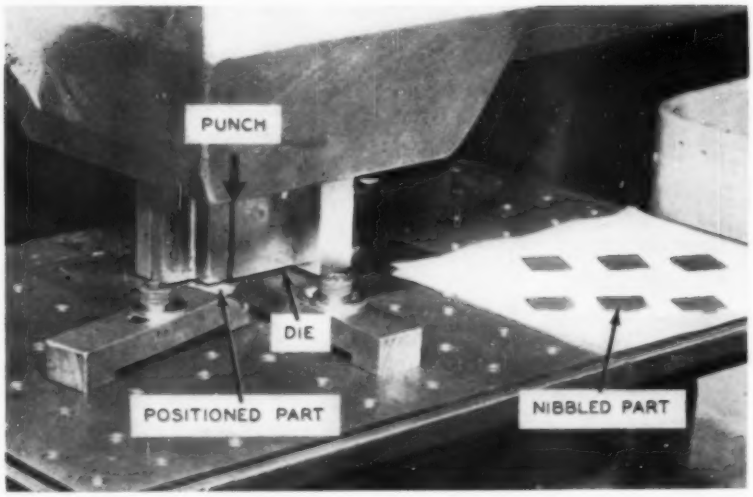
Manufacturing know-how necessary to produce laboratory quantities of developmental parts—compatible with high-volume factory-production quality—is a constant metalworking demand. The complexities of electron-tube development create countless problems to be solved. We believe that the ideas at RCA may provide answers for shop people far afield of electronics

H J ACKERMAN
L J CAPRAROLA
G C WALTHER
Tube Division, RADIO CORPORATION OF AMERICA
HARRISON, NEW JERSEY



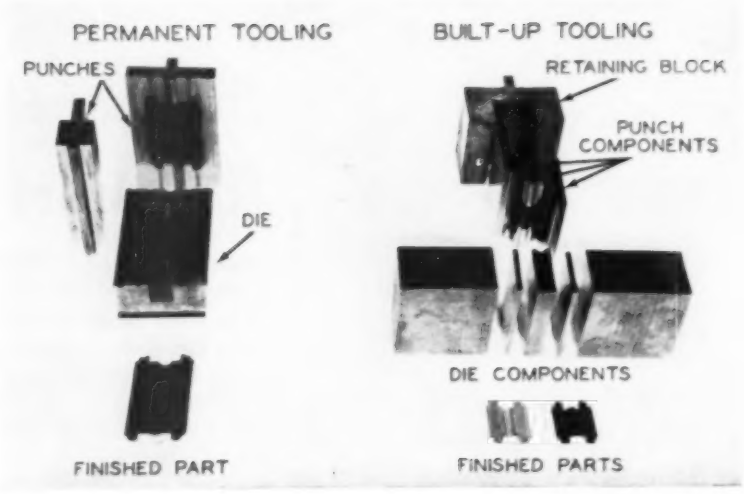
Rubber-die blanking . . . requires a hydraulic press, a rubber pad set in a cavity, a punch to fit the cavity contour, and a templet shaped to the outline of the desired blank. Die rubber is approximately 60 Durometer hardness and can be used for 3000 to 5000 blanks. The templet is roughly 10 times the thickness of the material being blanked. In operation, sheet stock is placed on the rubber pad and the templet is placed on top of the stock. As the punch forces the stock into the cavity, the rubber is compressed and the templet outline is blanked out of the sheet stock as the rubber forces the stock over the templet

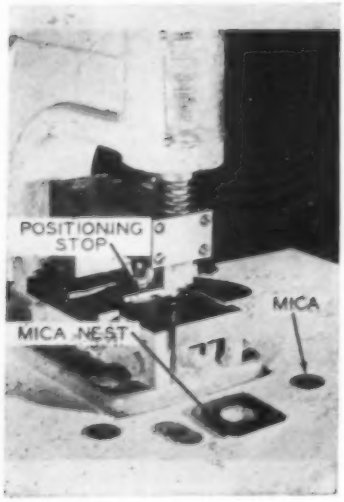
Simple shop practices for short runs . . .



Blanking by nibbling . . . requires a series of punches and dies. The blank contour is limited to shapes which can be created by combining the available standard die shapes, unless it is practical to make special die shapes

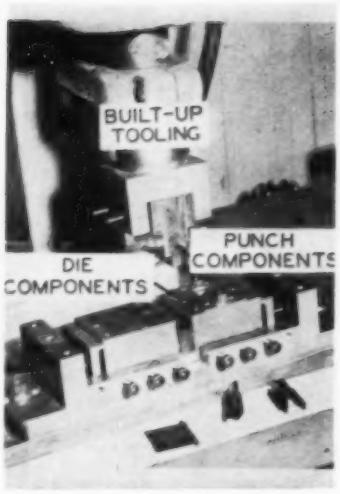
Permanent vs built-up tools . . . and the parts produced by each show the simplicity and versatility of the latter. Only the basic shop equipment is needed for built-up tools, which result from separating the overall tool shape into its simplest geometric forms and then assembling these forms into a retaining block. A controlled inventory of individual sizes and shapes, carefully cataloged, makes the system practical. Modifications in part design require only an interchange of the necessary sections

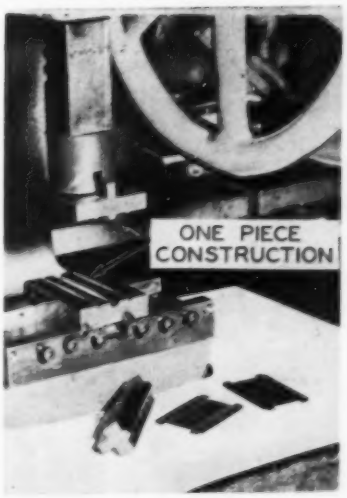


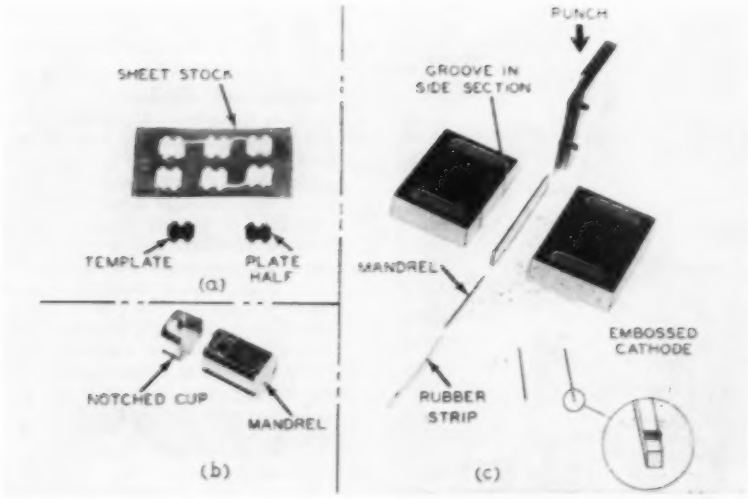


Patterns of small holes . . . can be punched to close tolerances in the setup used for mica spacers (right). Delivery of a mica die (left) takes months and the die costs hundreds of dollars. With the micrometer method for developmental quantities, spacers can be pierced and blanked in a sequence of operations, using standard punches and dies, in a relatively short time. Interchangeable tools are quickly replaced. A triangular ram on the press provides precise alignment and the longer ram bearing surface increases tool life. Micrometer prepositioning of the nest permits accurate spacing

Various bending and forming tools . . .
convert the blanked stock into the desired shape. A series of progressive operations simplifies the tooling requirement. Two types of tool-and-press combinations used to form plates are: 1. A punch and die made from built-up sections of hardened and ground flat stock and mounted in a power press (left) and, 2. A quick-and-dirty punch and die set up in an arbor press. The latter is most suitable if the arbor-press design includes gibs

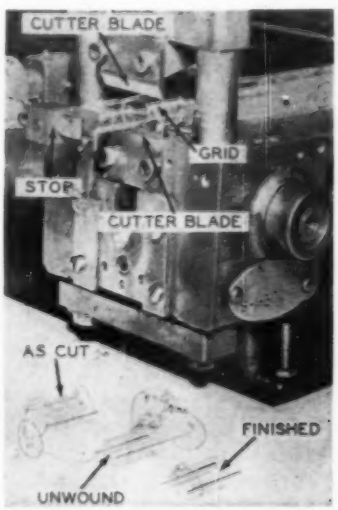




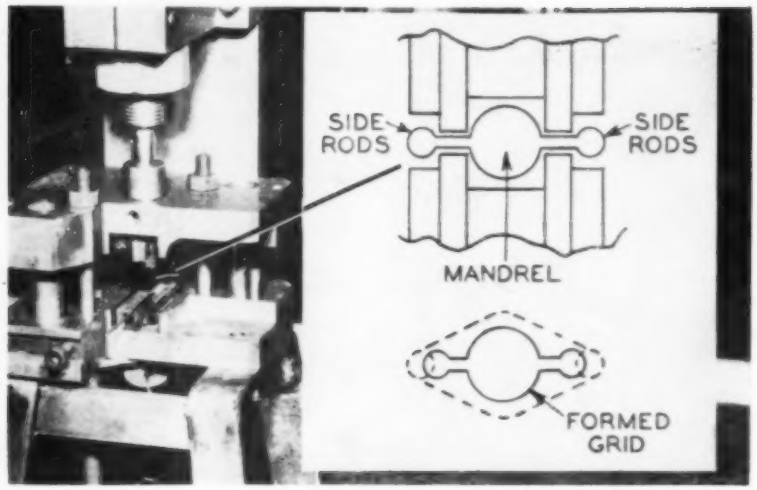


Unusual problems . . .
can be solved by built-up tools. Templet "a" is used to both blank and form the small plate half at the same time. In "b," the side of a cup is notched while the cup is supported on a mandrel. A rubber strip forms an expanding punch to double-emboss the small cathode in "c"

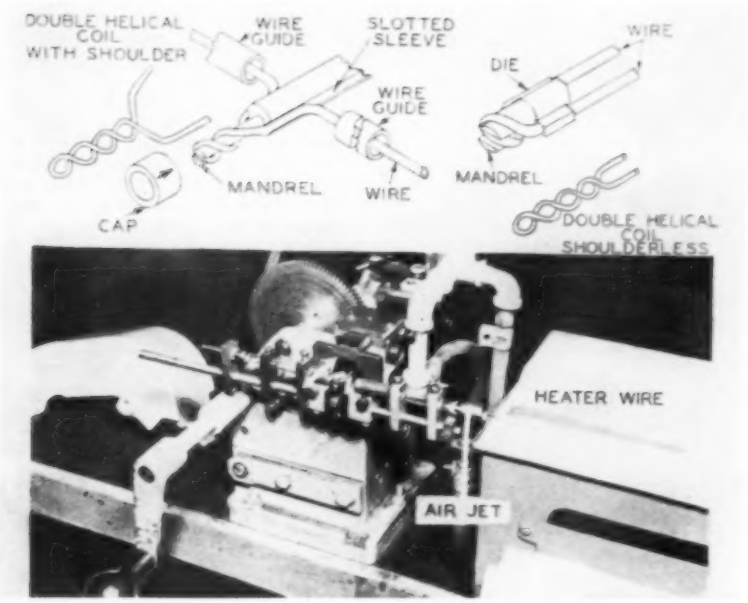
Guillotine cutter . . .
cuts developmental quantities of grid strips to length. Wound grid strips consist of alternate sections of peened turns (the grid body) and unpeened turns (the grid legs). Cutter stop is adjusted to cut the side rods to the proper grid-leg lengths. Grid-strip stretcher (right) produces a slight elongation of the strip to overcome the bow caused by stresses developed during notching and peening. Tooling, created from simple elements, produces very accurate work; it might solve a problem in making small quantities of other wire products



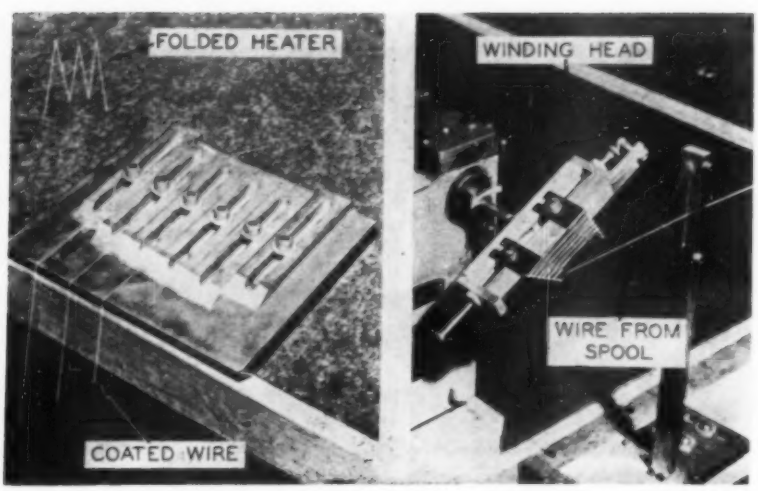
Simple shop practices for short runs . . .



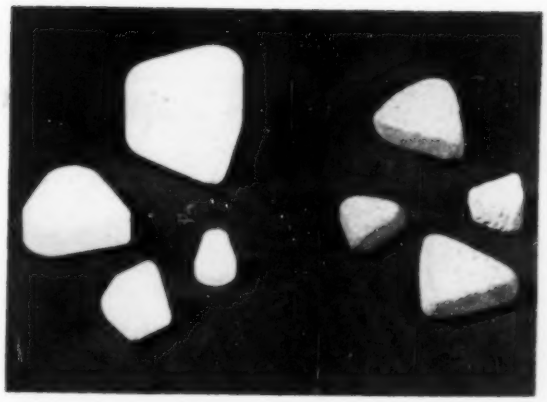
Shimstock technique . . .
forms round grids from grids having diamond or elliptical shapes; reproduces factory quality achieved with a two-piece die. Shimstock is assembled with suitable spacers to form the upper and lower opposed punches, then the die assembly is tightly clamped into a slotted block. Spacers can be cut from the same piece of ground flat stock to assure alignment of the "punches"



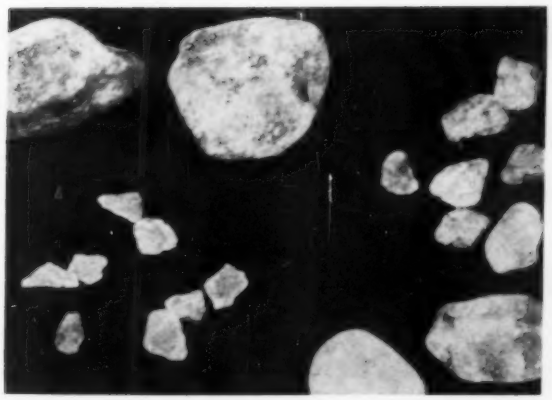
Simple coil winder . . .
produces complex double-helical coils. A pre-cut length of wire is injected into the "guides" by an air jet. The entire guide assembly, which carries the wire, is cam actuated. Wire moves into an interchangeable forming mandrel which is contained within and fastened to an interchangeable leadscrew assembly. A cap, having the same inner diameter as the outer diameter of the grooved sleeve, also moves back to hold the wire in the slotted sleeve. Mandrel and sleeve then rotate and move at a pre-set pitch until the coil is wound. Stops halt the machine to provide the required heater-leg lengths



Form blocks . . .
fold insulation-coated tungsten wire in a progressive bending operation (left). Blocks are built up from simple pieces, screwed to a plate, to provide the necessary number of steps. Simulated spade winder (right) consists of a double-helical-coil winding machine adapted, by the addition of a winding head, to produce folded heaters. Insulation-coated heater wire passes through the guide and around the interchangeable jaws which are driven by a reversible motor. Jaws are simultaneously retracted by the leadscrew at a preset pitch. Chipped heaters are recoated with insulation by cataphoresis



Man-made chips last longer . . .
Ceramic chips (left) and aluminum-oxide bonded chips (right) come in uniform sizes and shapes, wear slowly, and generate new cutting edges as they wear



Granite chips require more storage . . .
because of the variety of sizes. Shown here are only 4 of 12 sizes formerly stocked for tumbling operations. Granite also breaks up, and small scraps lodge in the parts

Which abrasives for barrel tumbling?

CLARENCE MATHEWSON, senior standardization engineer, Aeronautical Div,
MINNEAPOLIS-HONEYWELL REGULATOR CO, MINNEAPOLIS, MINN

With the variety of tumbling materials on the market today, it's not always easy to decide which is the best one for a particular application. At the Aero Division of Minneapolis-Honeywell, two series of tests were necessary to determine which would best satisfy our needs.

Tests made several years ago with natural chips pointed toward granite as the best tumbling materail; however, with the introduction of manufactured chips, another recent series of tests—including nine months in actual operation—have resulted in standardization on two manufactured abrasives: ceramic for deburring, cleaning, and improving surface finish, and ceramically bonded aluminum oxide for grinding action.

Sixty-five per cent of the parts run in the Aero Division are made of aluminum, but there are also stainless steel, hardened steel, and brass and copper parts. Standard test blocks were machined from all these materials, and every abrasive was tested three times with each of them. The machining burrs were intentionally left on the pieces so the deburring action could be observed.

Periodically during the test, the blocks were accurately measured to see how much material had been removed. The figures were later translated into an index of the abrasive's cutting ability.

The amount of chip breakdown was determined by weighing all the chips that went through a ½-in. screen and were stopped by a 5/16-in. screen. The starting weight for each test was 75 lb, and the difference between weighings was the amount of chip loss.

Other significant factors were the color and finish of the metal after tumbling and the cutting action on internal surfaces. These characteristics were not measured but were compared visually.

In the final analysis, one of the major reasons for favoring the manufactured abrasives was based upon their structure. Both the ceramic and the aluminum-oxide bonded chips are of a uniform shape and size, and they wear away slowly instead of chipping and breaking up. Granite chips, on the other hand, are irregular in shape. They tend to break up, and then the small pieces lodge in holes and grooves in the parts. Even though the abrasive mass was screened occasionally, additional small scraps were soon generated and inevitably got stuck in the parts. Therefore, the labor cost associated with granite chips was boosted by the additional hand work.

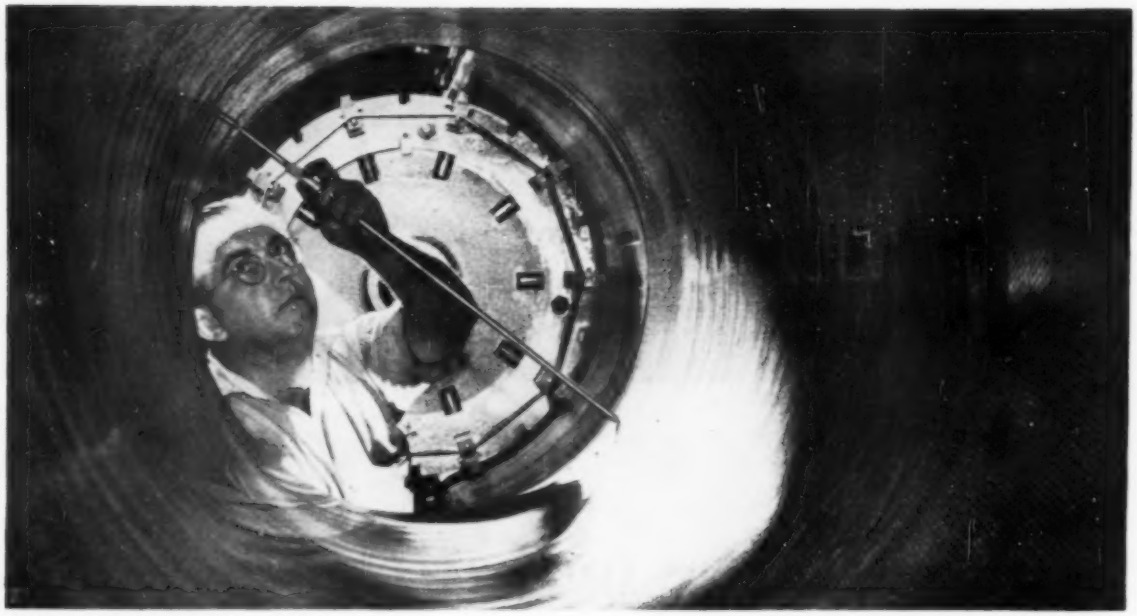
Cutting ability and chip life, of course, were the most important points of comparison. The granite chips cut well when they were new, but after about 70 hr, they were worn smooth. Granite does not generate new cutting edges as it wears down.

In this respect, the manufactured abrasives have a distinct advantage. As they wear down, they continually expose new, sharp cutting edges and can therefore be expected to cut at the same rate until they are so small that lodging becomes a problem.

Ultimate life had not been determined when the tests were completed, but the ceramic had run for about 1500 hr and was still cutting at approximately the same speed as when new. During that time, it had lost only 5% of its volume.

The aluminum-oxide bonded chips, during 600 hr of running time, had worn faster, losing about 10% of their volume, but they had maintained their cutting ability.

Combining all these advantages, the Industrial Methods Section estimates an annual saving of over $6,600 from the use of manufactured tumbling abrasives instead of granite chips.



Miking the ID . . .
is an important preliminary to honing, as well as necessary at frequent intervals during honing. Much of the success in this operation is still found only in personal skill, experience, and "feel." Multiple perforations in the surface caused less trouble than was anticipated, probably because of the right combination of speed, feed, abrasive, and coolant

Honing 10,000 sq. in. to 32 mu-in.

Large-area honing is routine at McKiernan-Terry Corporation's Special Machinery Division at Harrison, NJ—but most shops would find it a trying task. Here are basic data for diameters of 2 to 30 in., for lengths beyond 10 ft, and for many metals

WM M STOCKER, JR, associate editor

One of the jobs recently assigned to the Barnesdril No. 30 honing machine at McKiernan-Terry Corp was a perforated bronze suction-roll shell used in a paper machine. This piece was 24½-in. ID by 28-in. OD by 140 in long. It contained 67,000 holes, each 3/16 in. in dia. Specifications called for a 32 mu-in. rms finish on the inside surface.

This part was being reconditioned by Chromium Corp of America, Chicago. It had been stripped of chrome plate and was to be replated after honing. When checked for out-of-round, taper, and unstripped chrome before honing, the bore miked 24.520-in. dia. Careful measurement was necessary because a maximum stock removal of 0.040 in. was the total allowed, including cleanup.

With only three hours of setup, the job was ready to run. Paul Poliska, who did the job, started with a 120-125 grit roughing stone and then a 320-389 grit stone for finishing the last 0.003 to 0.004 in., miking frequently as the cut progressed. For coolant, he mixed a standard 60 parts of kerosene with 40 parts of Unionbase. The entire honing operation was completed in four hours running time to a 32 mu-in., or better, finish.

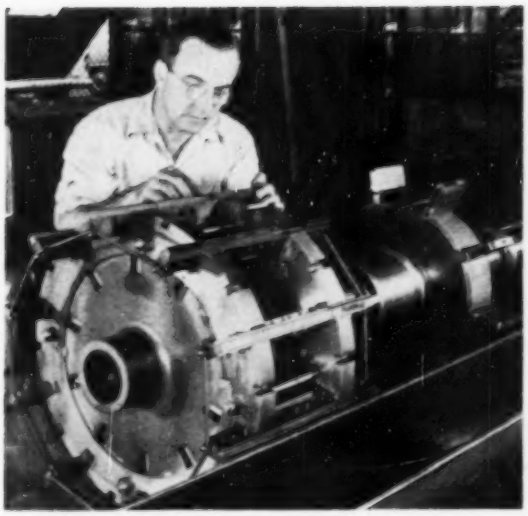
One of the reasons that a part of this size can be set up so quickly is the large stock of standard heads kept by the company. For this job a 18¼-in.-dia head, with a 24-in.-dia stone holder, was used, with a riser under each stone.

The honing machine provides a maximum reciprocation speed of 65 fpm and 10 to 102 rpm of the honing head. To actuate the hone expansion rod, a 4-in.-dia piston provides 12.56 sq in. of area which receives from 0 to 800 psi pressure. The taper on the conical pushrod for expanding honing stones is 12°, or an included angle of 24°. The drive motor is 30 hp while the headstock motor is 75 hp. A 1 hp motor powers the oil pump. Maximum capacity of this machine is 42-in. ID by 55 ft long.

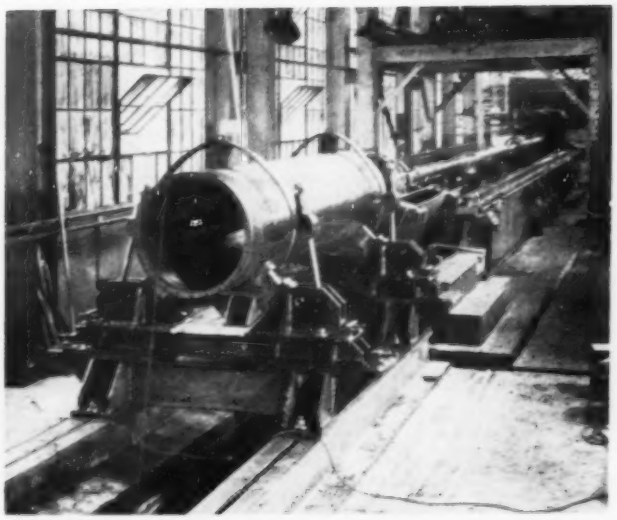
Information provided in the accompanying table supplies suggested speeds of rotation, and cycles per minute of reciprocation, for various diameters. These data are offered only as a basis for determining suitable factors. They are subject to the many variations established by local conditions.

HONING COOLANTS

Cast iron
Kerosene—20 parts kerosene mixed with one part International Compound No. 155 DS.
Mineral Seal Oil—
No. 3 White Star Lapping Oil—Socony Vac Oil Co



Risers under stones . . .
convert the standard 24-in.-dia stone holder to the 24.5-in.-dia bore to be honed



Capacity . . .
of honing machine is 42 in. ID by 55 ft long. Overhead crane simplifies loading and unloading while platform over machine, near headstock end, provides storage area for a variety of standard heads

Soft steel

80% Lard Oil—20% Kerosene
Lard oil is used to prevent tearing and shearing of the abrasives and work. It is sometimes necessary to use 100% lard oil when shearing continues to occur with the aforementioned formula.
85% Pale oil (100 SSU at 100 F) 15% lard oil, or

35% Oleic (commercial)
15% Turpentine
50% Kerosene
½ of 1% Murbane (deodorant)

Monel

35% Oleic (commercial)
15% Turpentine
50% Kerosene
½ of 1% Murbane (deodorant)

Aluminum

50% Lard oil—50% No. 3 White Star lapping oil

Brass, bronze & similar non-ferrous alloys
Kerosene
Note: Most alloys of this nature tend to load the abrasive. If the alloy is particularly hard, the above coolant is the most desirable. This also applies to aluminum.

Hard steel

10% Int'l Comp No. 155 DS—90% kerosene
Plain kerosene may also be used.

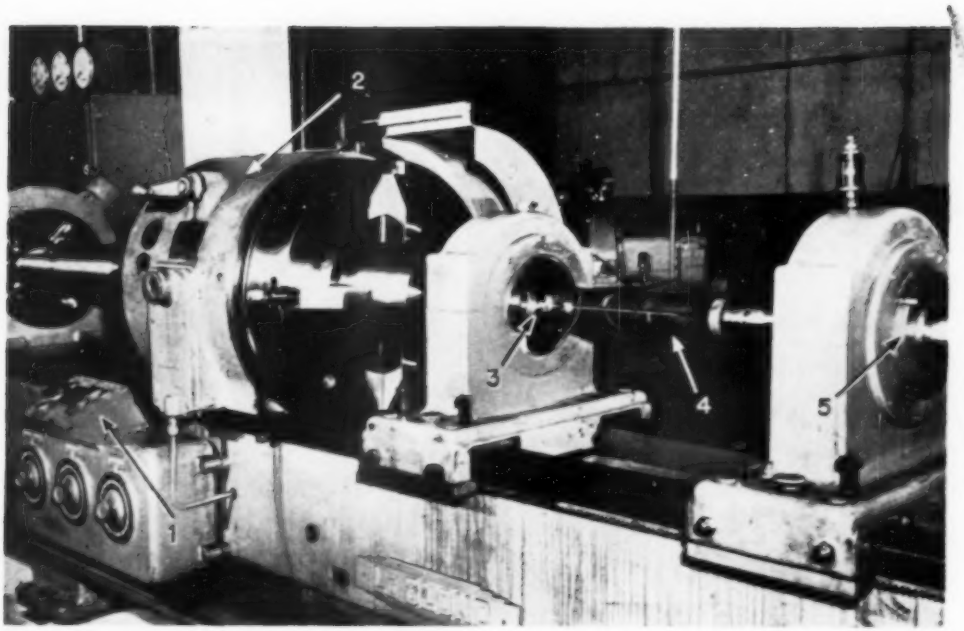
All of the aforementioned coolants are also dependent upon the nature of the honing abrasive. This is especially noticeable in all steel and non-ferrous metals. These data can be used only as a basis upon which to start, as a certain amount of trying will have to be done, depending upon the various characteristics of the metal to be honed.

TABLE 1 BASIC HONING SPEEDS

(Gray iron without alloy)

Bore dia/Stroke length inches	Rotation rpm	Reciprocation cycles per min.
2	382	140
3	255	83
4	190	70
5	153	56
6	127	47
7	109	40
8	95	35
9	85	30
10	76	28
11	69	26
12	64	24
13	59	22
14	55	21
15	51	19
16	48	18
17	45	17
18	42	16
19	40	15
20	38	14
21	36	13.5
22	34	13
23	33	12.5
24	32	12
25	30	11.5
26	29	11.5
27	28	11
28	27	10.5
29	26	10
30	25	8

Unalloyed steels: (10 to 20 carbon)—Reduce basic speeds 10% to 20%.
Alloyed steels: Where steel is alloyed with cobalt, chromium, vanadium, or any other alloy, and its tensile strength is affected, both the basic rotation and reciprocation speeds are reduced. The reduction in the reciprocation speed is, generally, somewhat less than that in the rotation speeds.
In nickel steel and steels alloyed for toughness and machinability, where the alloy does not materially affect the tensile strength of the metal, both the basic rotation and reciprocation speeds are reduced. Reduction in reciprocation speeds is generally somewhat greater, relatively, than that in the rotation speeds.
Non-ferrous metals: (Brass, bronze, aluminum)—Increase the basic rotation speeds approximately 20%, but maintain the basic reciprocation speeds.



Neoprene-pack reamer is set up on a hollow-spindle boring lathe. Details of setup include: 1. Machine-control panel, 2. Hollow-spindle chuck, 3. Friction-free starting bushing (to start reamer in work), 4. Pack reamer, 5. Friction-free bar bushing. Modification of the boring lathe to include this equipment makes reaming at 9 ipm possible

Rotating tools ream at 9 ipm

By rotating cutting tools, through a powered drive, instead of using the conventional static method, both speed and quality are improved. With its earlier developments in gundrilling and trepanning, work at Watervliet has shown that stationary tools are an unnecessary evil. Now *reaming* of large diameters is proved practical.

WILLIAM G McEWAN, project leader, MILLARD DOUGLAS, technical writer
MANUFACTURING METHODS UNIT, WATERVLIET (NEW YORK) ARSENAL

Results of reaming tests conducted with rotating cutting tools provide conclusive evidence that 1. A saving in machining time of 3 hr per tube (90mm M3A2) is possible. 2. The number of reamers necessary for the operation can be reduced from three to two. 3. With a rotating bar, the standard neoprene-pack reamer can be used for specified boring of this nature.

It is practical to apply this procedure to the removal of stock from long cylindrical parts within the physical range specified in this report. Also, similar tests should be conducted to determine the results with steels having higher physical properties.

During World War II, neoprene was developed as packing for 90mm reamers. It was used very successfully because of its resilience and its ability to absorb vibration which, in turn, permitted faster operating speeds with less tool wear.

Because of the success of reaming with this pack, it was thought possible to ream at a much higher rate of penetration than 2½ ipm, the maximum rate then in use.

In 1955, the Manufacturing Methods Unit started a project to reach a reamer penetration of 6 ipm. The machine used was a LeBlond boring lathe equipped with a rotating bar assembly. Because a penetration of 6 ipm was very readily achieved, it appeared likely that a greater rate of penetration could also be reached. Hence, feeds and speeds were increased to a penetration rate of 9 ipm. Reaming is normally done at a penetration rate of approximately 2¼ ipm with feeds of 0.015 in. per revolution and a surface speed of 130 sfpm. Starting at this point, feeds and speeds were gradually increased until the ma-

chine was operating at 500 rpm with a feed of 0.018 ipr.

Two tests were performed and the results, such as runout and cutter wear, repeated production results at lower feeds and speeds.

The new tooling required for this project consists of "friction-free bushings" and a "special pickup finger" for the "follow rings." The machine used in the operation was a No. 4 LeBlond hollow-spindle boring lathe, equipped with a rotating bar driven by a 20-hp dc motor.

Coolant was sulfurized fatty mineral lard oil. The reamer was a standard 90-mm neoprene-pack reamer with a bayonet shank.

All of the other operating conditions were normal except for the increased feeds and speeds, which are compared in the charts:

Old Method

ipr	*rpm*	
0.015	150	

New Method

ipr	*rpm*	
0.018	Bar	Tube
	300	200

Maintenance Cost:

Old Method
3 reamers at approx $17.00 ea
2½ hr @ $7.00 per hr
Total Cost: $68.50

New Method
2 reamers at approx $17.00 ea
2½ hr @ $7.00 per hr
Total Cost: $51.50

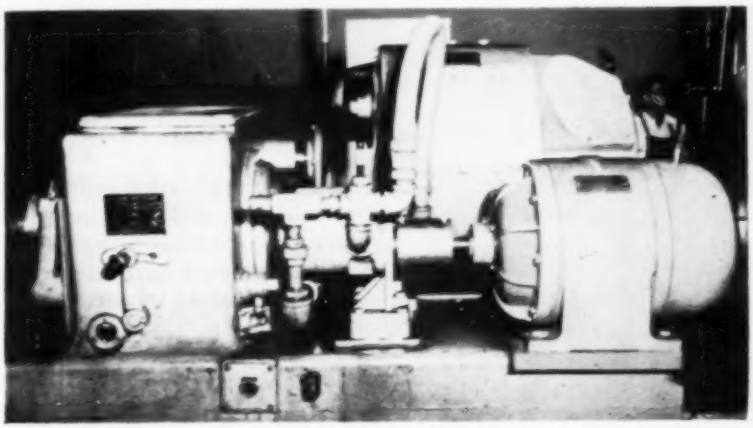
Conditions under which this technique is to be used:

1. On tubes having a yield strength ranging from 115,000 psi to 145,000 psi.
2. Tubes within the range of 20mm through 90mm.
3. Machines equipped as described in this report.

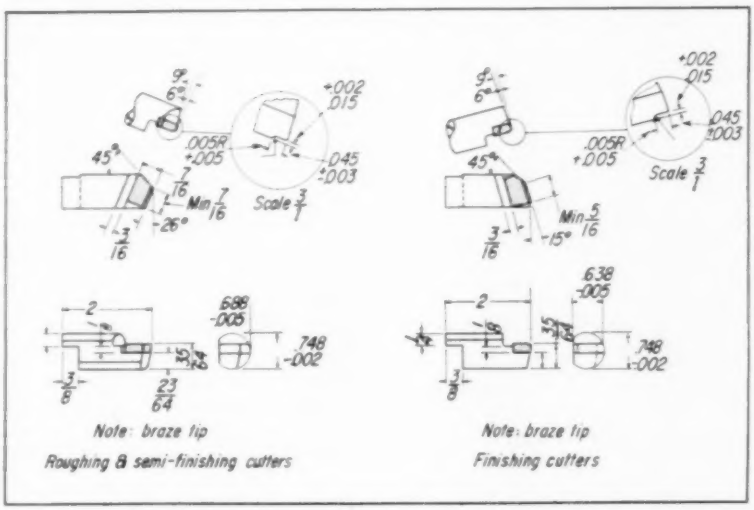
Major results accomplished were:

1. Rate of penetration was higher.
2. Number of reamers was reduced from three to two for this operation.
3. With this higher rate of penetration the actual cutting time has been reduced from approximately 3 hr 40 min to 40 min, a saving in machining time of 3 hr per tube.
4. Use of a rotating bar makes the standard neoprene-pack reamer useful for boring of this nature.

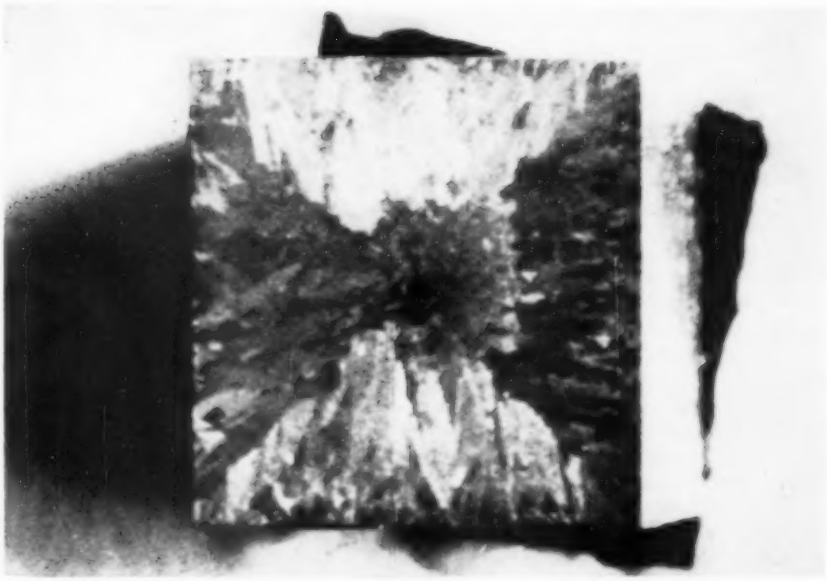
Neoprene was developed as a pack material for reamers during World War II and was widely used in making 90-mm guns. However, most reaming was with static tools and very little methods improvement took place until the recent tests with rotating tools—probably born out of the recent advances in gun reaming and trepanning with rotating tools, many of which have been accomplished at Watervliet



Rotating-bar assembly is necessary to provide cutting-tool rotation, consists primarily of coolant pump and gland plus spindle drive



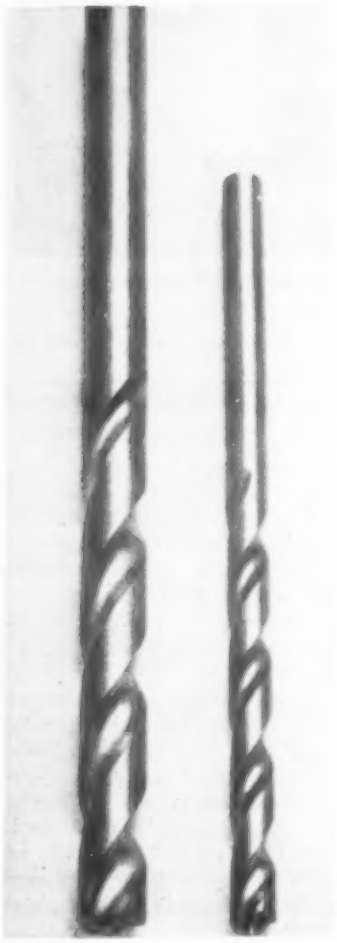
Cutting-tool drawings include details of design for roughing and semi-finishing and for finishing tools used with the neoprene-pack reamers



Grain structure shows clearly . . .
on Stellite Star-J ¼-in. toolbit after electrolytic grinding with D6WHV diamond wheel. Black spot in center is hole, created along with diagonal lines as the material cooled after being cast. None of these details would be visible after conventional grinding because of smearing effects

How to Machine

C R STROUP, vice president, ANOCUT ENGINEERING CO, CHICAGO



After five years of development (*AM*—Nov 10 '52 p154 and Sept 28 '53, p122), electrolytic grinding has evolved into a reliable cold-machining process that will work many materials, hard and soft, to produce fine finishes and accurate surfaces. It does not distort metal crystal structure, and it will machine honeycomb without producing burrs. Here are basic principles, operating techniques, and the latest advice on successful application . . .

Hard or refractory materials are a prime target for the electrolytic-grinding technique. Carbide cutting tools, wear strips, and dies, for example, are difficult to shape except with diamond grinding wheels, but the electrolytic principle can be applied to grinding with diamonds to speed the work and reduce diamond consumption as much as 80% in some cases.

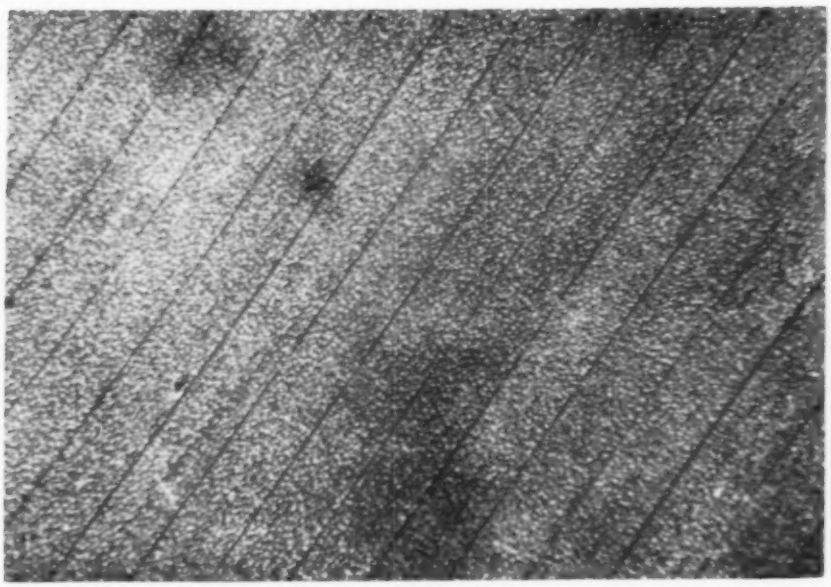
Electrolytic grinding can also cut such temperature-sensitive materials as nickel and titanium. Electrolytic grinding is essentially a cold process, and it will allow faster metal removal than conventional grinding where grinding action raises the temperature.

Stainless steel and high-alloy steels often form large burrs when they are ground conventionally, and this brings in a third advantage of EG, which produces burr-less finishes as smooth as 15 mu in. or better. Stainless-steel honeycomb, for example, can be ground without burrs or layover even if foil thickness is as thin as 0.001 in.

EQUIPMENT NECESSARY

Conventional grinding machines of almost any general type can be modified for EG work, and a large number of manufacturers are now making these modified machines available for use with the special power supplies necessary for electrolytic grinding. First, the machine spindle must be electrically insulated from the rest of the machine. A slip-ring and brush assembly must be fitted to the spindle to carry electrical current

Solid carbide drills . . .
were fluted at Union Twist Drill Co with electrolytic machine and formed wheel. Production between wheel dressings increased ten times over old rate



Laminated transformer core . . .
has sharp definition between laminations, indicating accurate grinding with electrolytic setup. Conventional fabrication would require etching and lapping. Magnification is 12X

Difficult Workpieces

through the spindle to the grinding wheel. The machine must also have a slow feed rate for the work because best results are obtained when cuts are taken to full depth. For some applications a skip feed may be most practical, allowing a slow feed rate across an area to be ground, a faster rate over an area not to be ground, and a second slow rate across another area to be ground.

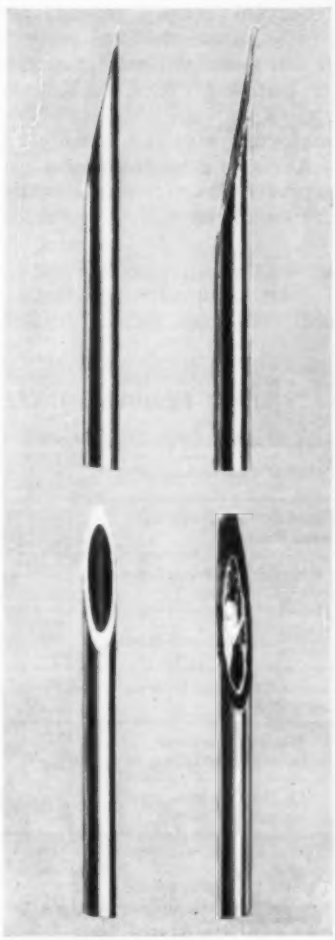
FORM GRINDING

EG's low wheel-breakdown rate makes it an ideal process for form grinding. One current job is grinding the involute form in case-hardened gears with a non-diamond metal-bonded wheel. The regular dressing mechanism for the grinder is used to reshape the wheel when necessary. Another current job is grinding segments for lamination dies from solid blanks.

Formed wheels for EG can be crush-formed by rolling a single layer of diamonds into the face of a formed copper disk, using a formed crush roll of hardened steel. Relatively inexpensive wheels can be made this way to accuracies of 0.0001 in. on the formed area. For short runs the wheel may be operated directly after being charged with diamonds. If long runs are in prospect, more strength is attained by plating a thin layer of nickel over the diamonds. The nickel shrinks around the individual diamond particles and bonds them tightly to the wheel. When the run is completed, the diamonds can be reclaimed.

HOW IT WORKS

Electrolytic grinding requires an electrically conductive, metal-bonded wheel impregnated with abrasive. Low voltage (6 to 18 v) is applied between the grinding spindle and the worktable or fixture. A special electrically conductive coolant is used. Accordingly, current passes from the metal matrix of the wheel to the work itself in a direction to make the work an anode in an electrolytic cell. Under these conditions the work surface is removed through precisely controlled electrochemical decomposition, similar to but much faster than conventional de-



Hypodermic needles . . .
produced by conventional abrasive grinding (right) and by electrolytic grinding (left)

Electrolytically-Ground Materials

Alnico
Brass (porous powdered metal)
Chrome-plated materials
Durimet
Flame-plated carbide
Hastelloy
Honeycomb: Stainless Steel
Aluminum
Titanium
Inconel
High-temperature alloys (A-286, M252, etc.)
Inco 700
Inconel (all alloys)
Monel Metal
Nickel
Nichrome
Ni-Span "C"
Nitralloy
Permalloy
Phosphor Bronze
PWA692
Resistor Pads
Silicon Steel
Spotwelds
Steel: Case-Hardened
High-speed
Stainless (all types)
Stellite (all grades)
Tantalum carbide
Tinadure (A-286)
Titanium (all alloys)
Titanium carbide
Tungsten carbide
Vasco Supreme
Vitallium
Udimet 500
Waspalloy
Zircalloy

Examples of Successful Electrolytic Grinding . . .

Hard materials:

- Offhand, surface, and cutter and tool grinding on single- and multiple-point carbide tools
- Stellite and refractory HSS tools and cutters
- Chrome-plated, flame-plated, case-hardened surfaces
- Carbide-tipped saw blades, cutoff tools, grinder work-rest blades
- Flute grinding on carbide & HSS drills, end mills, and reamers
- Gears, carbide-tipped valve lifters

High-tensile metals ground without burrs or layover:

- Transformer core legs, magnetic laminated structures, rotors, stators
- Spotweld samples to expose the "nugget" so dimensions and grain structure can be inspected
- Pointing hypodermic needles
- Porous stainless-steel-fiber filter materials

Temperature-sensitive materials:

- Jet-engine blade and bucket materials and reactor elements made of nickel alloys, Udimet 500, vitallium, Tinadure, titanium, and other high-tensile metals

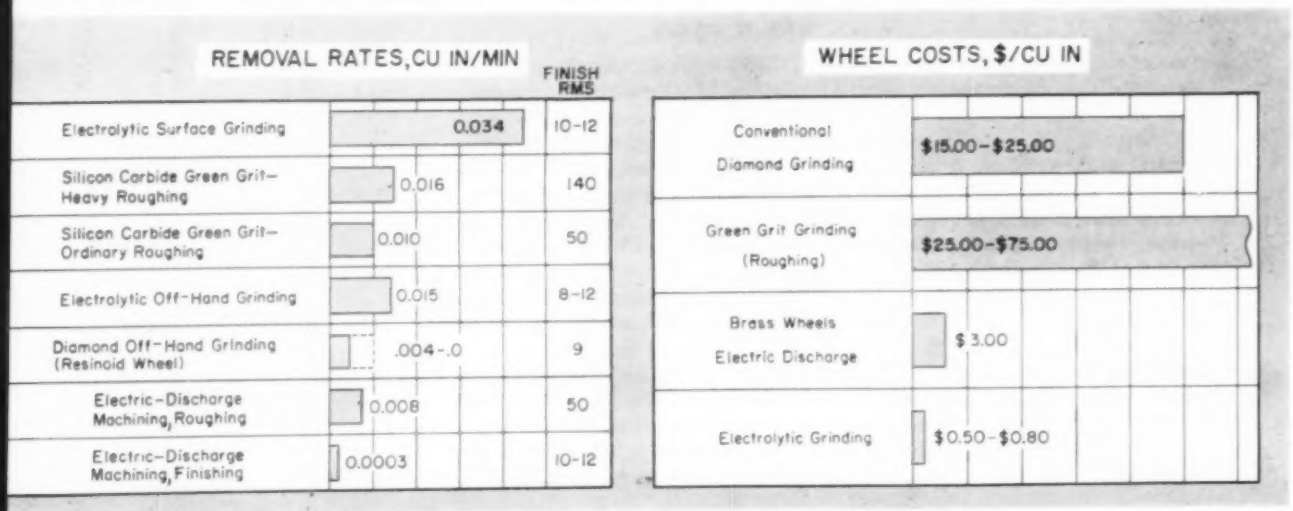
plating. Most deplating is done with a current density of about 5 amperes/sq ft, or 0.035 amp/sq in., while EG is done with currents of 500 to 1200 amp/sq in.

Current density depends principally on the chemical properties of the material being ground, not its hardness. Thus, carbides are ground with low density and hardened steel with high density.

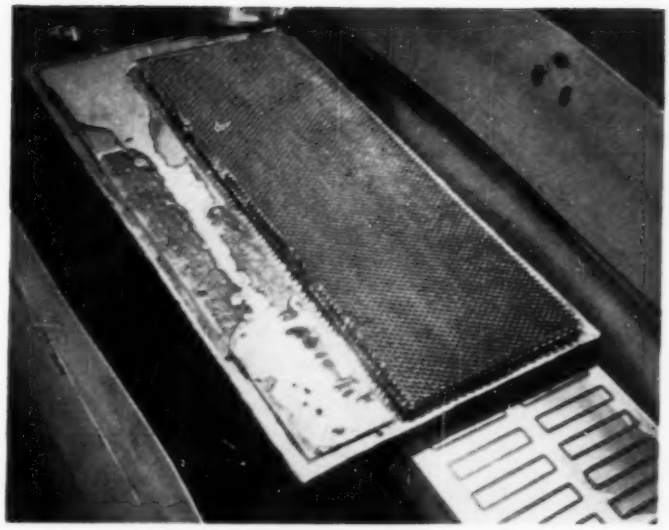
Abrasive grain in the wheel acts to prevent short-circuiting between the metal bond of the wheel and the work, and at the same time scrubs the surface of the work.

Electric power is supplied by a unit that may include automatic voltage and current control that provides optimum conditions for the particular piece being ground. Optimum level is determined by the condition of the wheel, work size, type of material, etc. For example, steel-cutting grades of carbide should be ground with 6-8 volts, while cast iron takes 4-6 volts.

When sparking occurs between the wheel and the work, the automatic control changes the voltage accordingly. The object is to use the highest voltage possible while keeping sparking to a minimum. With high voltage there is high current and rapid metal removal. But sparking damages the wheel and produces a rough finish on the work. Coolant is usually a nitrate-base material supplied in powder form and mixed with water at 10:1 by weight.



These comparisons . . .
were all based on tungsten carbide, the electrolytic data from tests, and conventional and electric-discharge data from published reports. Costs data is from users, published reports, and laboratory tests



Stainless-steel honeycomb . . .
was ground on Cincinnati planer equipped with electrolytic power supply. Twigg Industries, Terre Haute, Ind, produced the panel for B-58 Hustler ailerons

How to Make a Copper Form Wheel for Electrolytic Grinding

1 Machine copper disk to desired dia and width. If copper is a casting, it should be cast ¼ in. oversize on all dimensions for cleanup.

2 Machine arbor hole for 0.0005-in. push fit on arbor.

3 Make up backing plate and ring against which wheel can be trued laterally on the grinder. Drill and tap eight ⅜-in. jacking-screw holes in wheel.

4 Machine and grind desired form on wheel OD. Machine crushing roll at same time to negative of form so the two wheels mate.

5 Mount wheel on grinder, then true to eliminate both eccentricity and lateral runout within 0.0002 in.

6 Mount crushing roll so it may be turned by hand, and true it with wheel.

7 Align crushing roll to wheel by moving them together gradually while watching contact area against white background. Increase engagement pressure until full contact is made and roll swages wheel to exact form.

8 Disengage roll from wheel then apply thin film of light machine oil and sprinkle diamond powder on wheel. Can with small holes (No. 80 drill) will do. Capture excess powder. Diamond powder is 120 grit, and total coverage should be ½ carat/sq in. of wheel area for maximum grinding power.

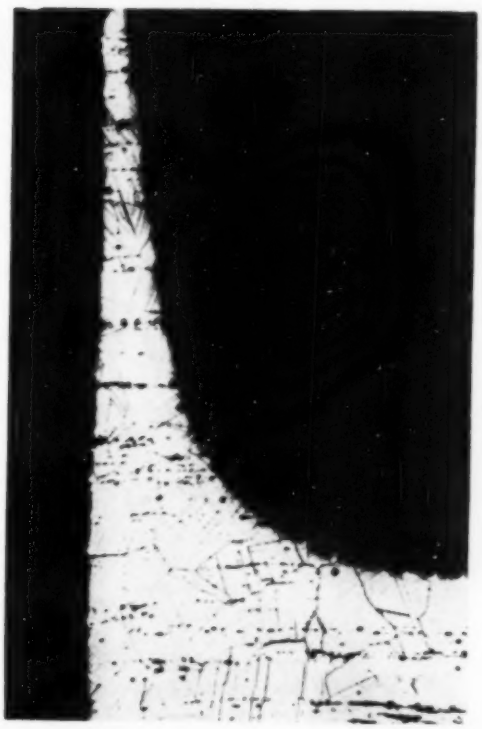
9 Engage roll and wheel again until they can be rotated by hand without slipping. Rotate wheel by hand, closing up engagement by 0.0005 after each revolution until engagement is within 0.001 in. of that reached before diamonds were added.

10 Disengage, brush roll and wheel with carbon tet to remove excess powder, and examine wheel for bald spots.

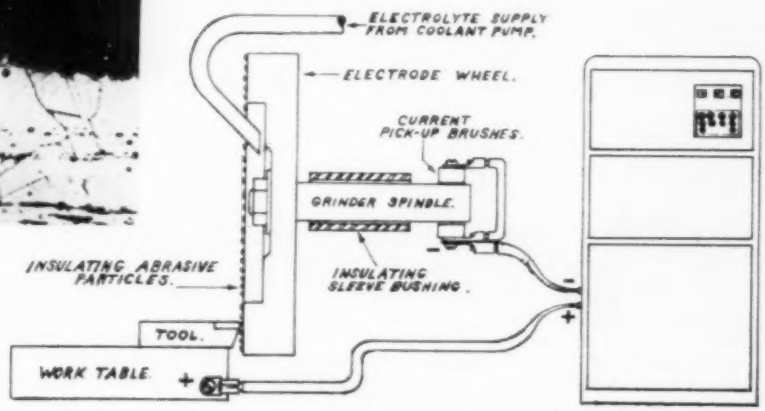
11 Repeat diamond additions until three layers have been applied.

12 Clean wheel and remove roll. Wheel is now ready for short runs, and may be brought back to tolerance by adding another layer of diamond powder.

13 For long-run production, plate thin layer of nickel over wheel to grip diamond powder tightly to wheel.



Feather-edge section . . .
was left standing between two surfaces machined by electrolytic grinder. Undisturbed grain structure of the Udimet 500 stock indicates cool and non-warping machining action. Magnification is 500X



Essential hookup for EG...
is from special power supply to machine with insulated spindle

TWO REPORTS ON ELECTROLYTIC GRINDING, II

Test results make a

Ordnance Corps research on electrolytic grinding helps establish the limits and potentials of this relatively new metalworking process. Included are a number of points that show where and how trouble may develop, and how to combat it

FRED PEARLSTEIN, chemical engineer, Pitman-Dunn Laboratories, FRANKFORD ARSENAL, PHILADELPHIA

Preliminary tests at Frankford Arsenal showed that the electrolyte applied for electrolytic grinding had considerable effect on the process. For example, chloride solutions promoted rapid grinding, but they were corrosive to the work and the machine. Water glass had a slow grinding rate and it produced unpleasant fumes. The best solution tried was 5% potassium nitrate, which promoted fast grinding and had high conductivity. It was used throughout the tests.

Grinding was first done on a modified Cincinnati grinder equipped with a 6-in. single-layer diamond wheel with about 0.001-in. diamond protrusion. Workpieces were ½-in.-square carbide tools, which were ground under various conditions to show the effects of these factors:

Voltage and current
Pressure of work against wheel
Rotational speed of wheel
Area of contact between work and wheel

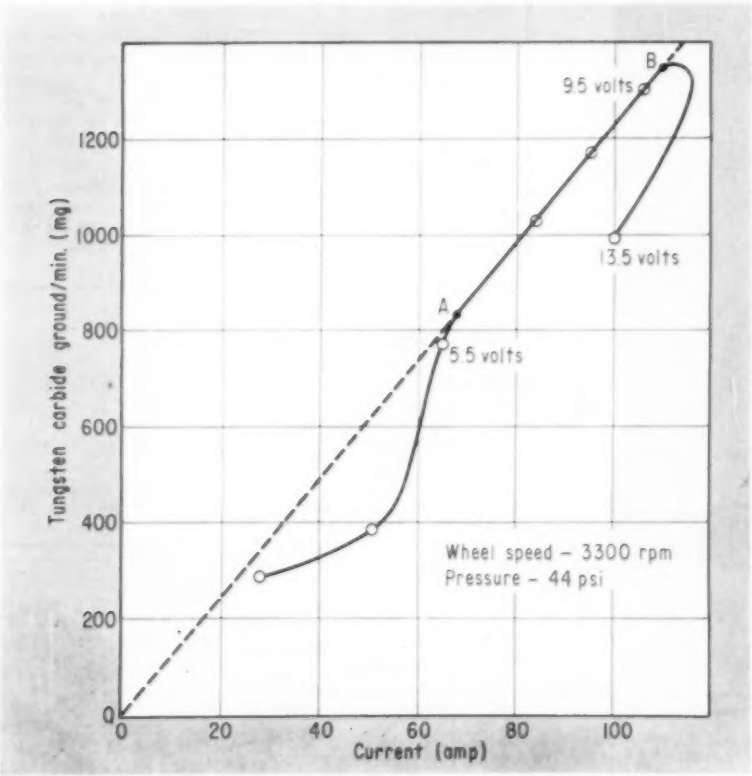
Results are shown in the accompanying charts. Approximately 6 cu in. of carbide was removed altogether without detectable wear on the wheel.

A second set of tests was made on a Hammond X-266 grinder to examine results in:

Offhand and chipbreaker grinding
Grinding head form tools
Grinding band seat tools
Regrinding worn and chipped tools

Chipbreakers were ground electrolytically on single-point tools with a metal-bonded diamond wheel, taking a single pass to full depth with light pressure against each tool. Time for grinding electrolytically was somewhat longer than by conventional methods, but wheel losses were much less. A diamond wheel normally requires redressing after doing about 150 chipbreakers, but the electrolytic method gave wheel life of over 900 before redressing. Electrolytic grinding rounded the tool edges slightly, but this factor was unimportant in this case; tool edges are often intentionally rounded in conventional grinding.

Form tools were ground experimentally, taking a single pass with a 7-in. wheel machined to the contour desired and impregnated with diamonds. Steel shanks on the tools were premachined and undercut so the electrolytic wheel would work only on the carbide. Head



Best grinding efficiency is on straight portion of curve, which represents 100% coulombic efficiency, according to Faraday's Law. Point A represents minimum practical current, and point B indicates sparking potential, at which sparking occurs. These results were for a particular test, but any case will show a similar curve and a similar straight-line section for best operating conditions

troubleshooter's list

form tools were ground this way. The first one was roughed electrolytically, then finished without current flow until the tool had a shiny surface (electrolytic grinding produces a dull finish). The next tool was roughed at 6 volts and 30 amps, taking about 9 min. It was wire-brushed and compared to the first tool, which showed up the effects of non-uniform electrolytic oxidation on the contour. Then current and voltage were reduced and another 0.008 in. of stock was removed, and finally 0.003 in. of stock was removed with low current and voltage. The result was as accurate as the first tool. After 200 tools were ground this way, another check was made of form accuracy (shadowgraph), and the result indicated some wear but not beyond tolerance.

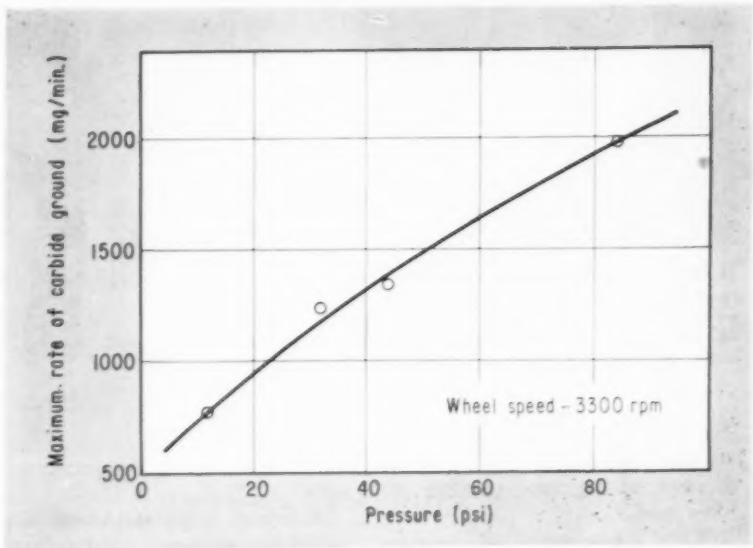
Typical grinding conditions for these head form tools were 5 volts, 22 amps, and 6 min. for roughing; 5 volts, 16 amps, and 1.8 min for semifinishing; and 3 volts, 12 amps, and 2 min for finishing. Semifinishing cuts were 0.008 in. deep, and finishing cuts were 0.003 in.

When band seat tools were ground, non-uniform oxidation showed up again. This became excessive at more than 5 volts. Roughing was done to a depth of 0.018 in., taking around 3 min with 20 amps and 5 volts. Finishing was done to 0.002 in. at about 4 volts, taking less than a minute.

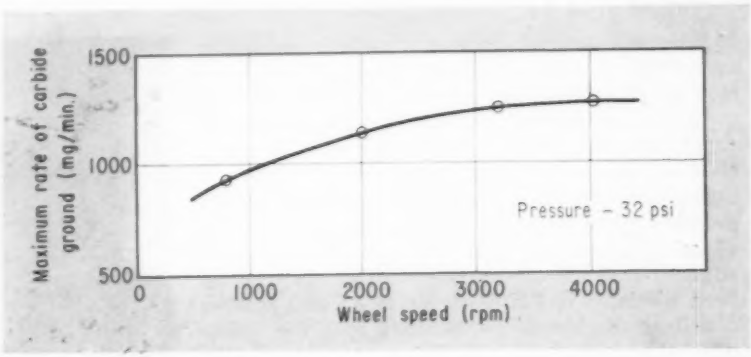
Regrinding on worn or chipped tools was done electrolytically with a form wheel or conventionally along the chipbreaker face. The choice of operation depended on which method would result in less carbide loss.

CONCLUSIONS

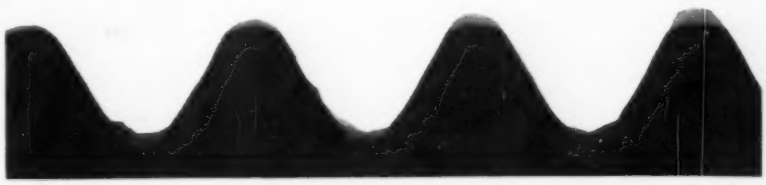
These tests indicated that electrolytic grinding increases the life of diamond wheels, and if single-layer wheels are used the efficiency of the diamonds is increased. Offhand grinding for single-point tools was not superior to conventional



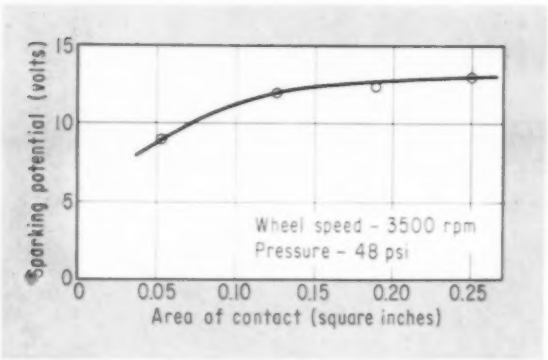
Effect of grinding-wheel pressure is shown by tests at 12, 32, 44, and 84 psi. As pressure increases, electrical resistance across the gap decreases, and current increases if voltage is held the same. Limiting factor is point where wheel begins abrading the work mechanically, which occurred at 84 psi in this test



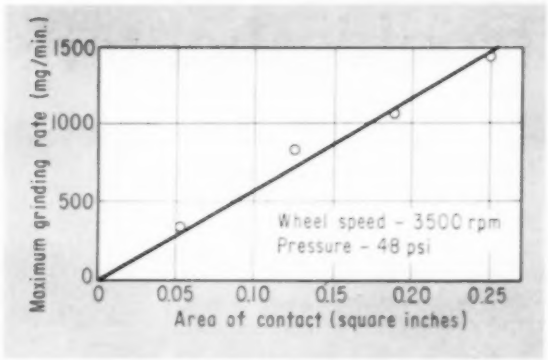
Higher wheel speed increases rate of metal removal. Curve appears to be approaching a maximum limit at 4000 rpm in this test. Any other given setup might have a different top limit



Band seat tool form was ground two ways: lighter shadowgraph shows result after a single electrolytic pass; darker image shows form after conventional grinding. Difference is result of non-uniform oxidation. Correction was made by taking finishing cut at reduced voltage and amperage to depth of 0.002 in. Total grinding time was about 4 min



More contact between wheel and work means higher sparking potential, which indicates the top voltage at which the setup can be operated. Current density in this test was around 480 amp/sq in. in all cases. It was difficult to maintain constant wheel pressure during the test, so results are not wholly reliable



Grinding rate increases as contact area increases. Some operations have reflected a grinding rate of 600 mg of carbide/min; however, that rate can be maintained only by exceeding 0.1 sq in. of contact area

grinding, but electrolytic grinding allowed doubling the average number of regrinds possible for form tools.

Water glass, applied as the electrolyte, allows maintaining sharp edges on the work, but grinding is slow.

As wheel speed and pressure of wheel against work are increased, higher currents can be drawn and the cutting rate goes up. Contact area has the same effect.

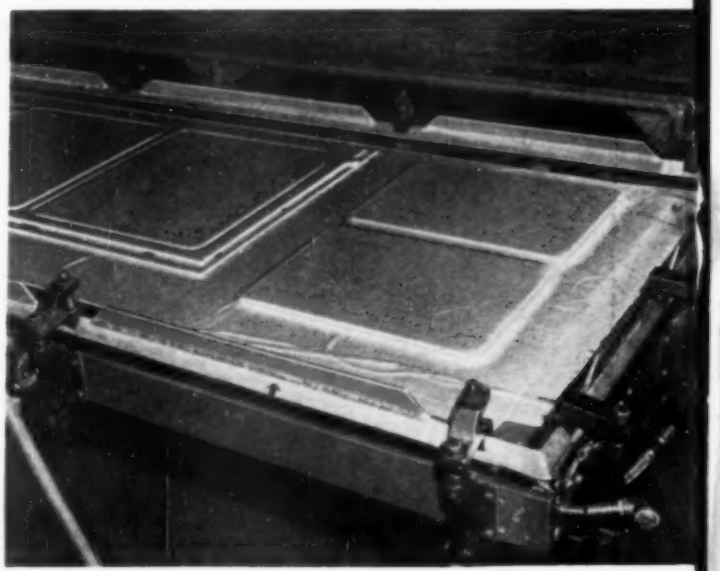
Worn tools can be reground with minimum loss of carbide.

PVA sheet simplifies autoclave bonding

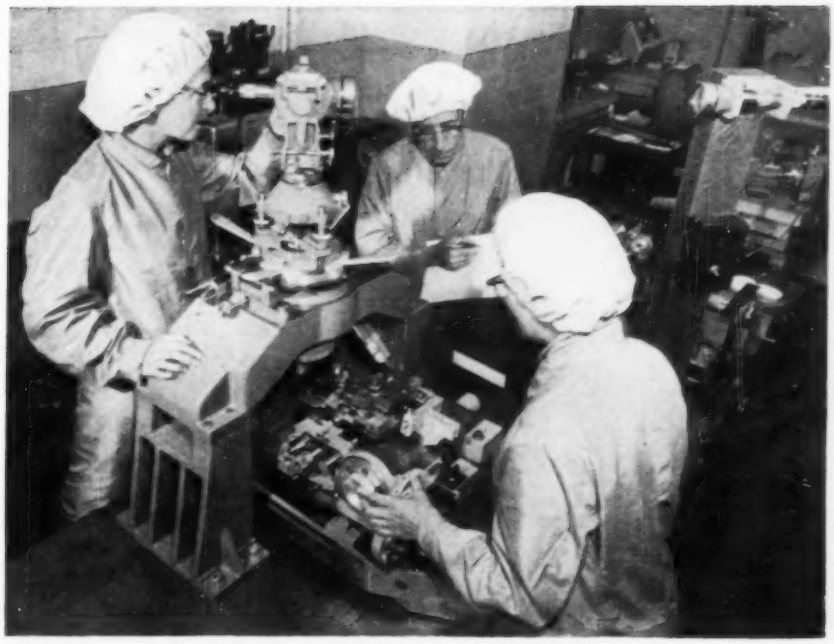
When metal aircraft wing and fuselage assemblies are bonded together with phenolic adhesives (*AM*—Mar 11 '57, p144), they are usually laid up on a metal platen, covered with an airtight blanket of rubber or plastic, then inserted in an autoclave. Heat and pressure do the bonding.

The kind of blanket material has recently been a problem. Some materials tend to bond in with the adhesive, others ignite, and some fail along sharp edges of complex curves. One solution has recently been developed by J H Foley and W J Vogel, plastics div, Reynolds Metals Co, working with the industrial engineering staff of Fairchild Aircraft Div, Hagerstown, Md. The material is a new formulation of polyvinyl-alcohol sheet that will withstand 500 F and 200 psi, and will conform to irregular shapes without tearing. These properties make it unnecessary to provide supplementary tooling to hold down the work at points where other blanket materials would be weak.

Bonding works like this: Metal parts are coated with adhesive on mating faces, then assembled on the platen. A blanket of asbestos or glass fiber is laid on, then the PVA sheet is added over the top. The blankets are clamped by rubber or metal strips, then trapped air is squeegeed out toward a vacuum line inserted through the platen or under the



blankets. The platen is loaded into the autoclave where curing takes place. Temperature is around 500 F, and pressure is raised inside the autoclave to 105 F.



Measurement laboratory . . .
. . . contains Sperry's gear analyzer (line-of-action dontometer) in an air-conditioned (70-72, ± ½ F), contaminate-controlled (max. 2 microns) humidity-controlled atmosphere. Inspector Martha Mulvey sights through a Wild T-3 theodolite to measure gear position. Wild collimator at left is fixed reference. Senior laboratory technician Arthur Cole, center, and inspector Rose McMeekin check displacement of quartz-rack tooth in mesh with gear

Line-of-action dontometer inspects spur gears to ± 1 sec of arc

RONALD J ROSS, engineering section head, Advanced Studies,
SPERRY GYROSCOPE CO, GREAT NECK, N Y
in conjunction with JOHN P WRIGHT, associate editor

Now ultra-precision spur gears are inspected to a maximum permissible non-adjacent tooth spacing error, for entire active profile, to within ± 1 sec of arc. Our current report describes how the gear-analyzer was built and how it operates. Special Report No. 442, May 21, '56 describes how Sperry hobs ultra-precision gears accurate to within 10 sec of arc

Because there is no conventional instrument available that can inspect a gear to within this tolerance. Sperry developed and built their own gear-analyzer. This instrument, the most accurate of its type presently known, measures gear-involute geometry and separates all the geometric errors in a spur gear. Typical applications of these precision gears are in critical weapon systems of extreme accuracy, including airborne beacons that enable long-range aircraft to refuel in air regardless of darkness or weather, in super-radars to track enemy planes and guide long range missiles such as TALOS to the target, and in counter-mortar radars to pinpoint enemy mortar locations for destruction.

The line-of-action dontometer was primarily developed for trouble-shooting gear problems, for gear analysis, and for engineering experiments. At the present time the gear analyser is operated manually;

Line-of-action dontometer . . .

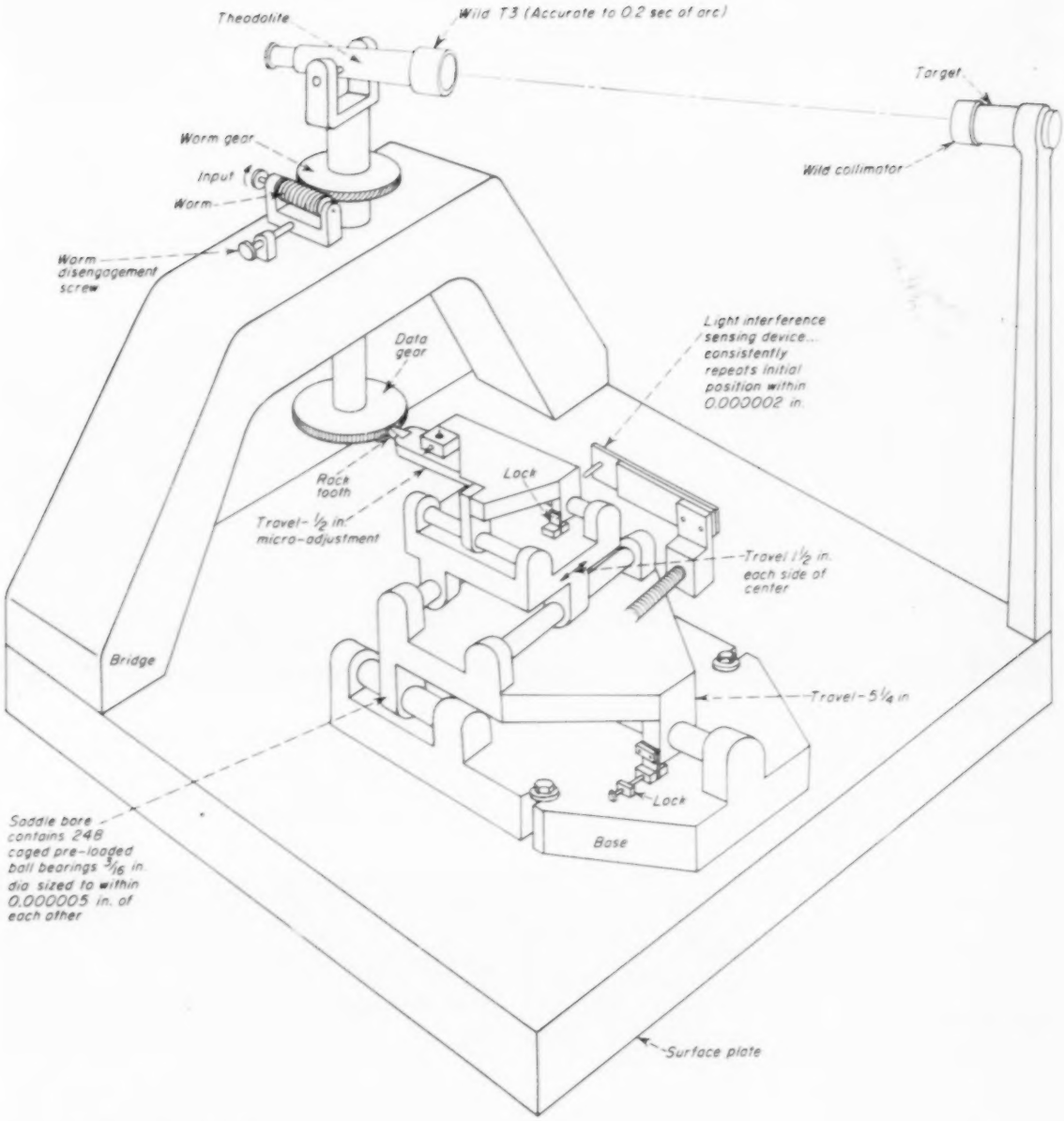
Gear is slewed into position . . .

. . . with capstan handles on bridge spindle. Rack tooth translates on coordinate guides (structure beneath the theodolite bridge). Rack tooth displacement is 3 in. tangentially to the gear, and five inches radially from gear dead center. Optical indicator, at left center, is secured to micrometer positioning screw, and detects a displacement of 0.000002 in. Leadscrew and nut are not physically attached to rack-tooth carriage. Eventually, the leadscrew and nut will be replaced by an optical device to obtain a more accurate measurement of rack-tooth movement. Cycle time to check a gear is a variable because actual time spent inspecting a gear is a factor of what errors and what kind of information is being determined. All personnel are required to wear lint-free nylon smocks and caps in the measurement laboratory as a precaution against contaminating sensitive instruments. Cast-iron surface plate, on which gear analyzer is mounted, is an old timer, and has seasoned for a period of 25 years. Plate measures 1x4x6 ft, is anchored to a solid concrete bed, and has been scraped to a total flatness of 0.000030 in.

however, in the near future Sperry plans to modify the instrument for completely automatic inspection of their ultra-precision gears.

Accumulative errors from the gear-cutting process are detected by the instrument and the data is analyzed. Information obtained from the analysis is then used to correct discrepancies in the gear cutting process and to step up production inspection of gears. To inspect gears on a production basis Sperry uses a rotary head for indexing the gear, and a single rack tooth that engages both sides of the gear tooth. The rotary head is accurate to ± 1½ sec of arc, is calibrated to 1 sec of arc, and gives readings for non-adjacent gear-tooth spacing, as well as size of gear PD. Currently, there is in a stage of development an improved version of another gear-inspection instrument that will dynamically check gears on a production basis. However, this instrument differs from the line-of-action dontometer in that it will only indicate whether or not gears are within specification. Data gear train errors are usually expressed in some form of input-output angular error. Sperry finds it is more convenient to express ultra-precision gear errors in terms of non-adjacent tooth spacing error—the maximum permissible spacing error (in seconds of arc) over the entire active tooth profile, between any two arbitrary teeth on the gear.

Sperry uses the instrument to check gears from 32 to 64 pitch, but there is no limit to the range of gear pitches that can be checked.

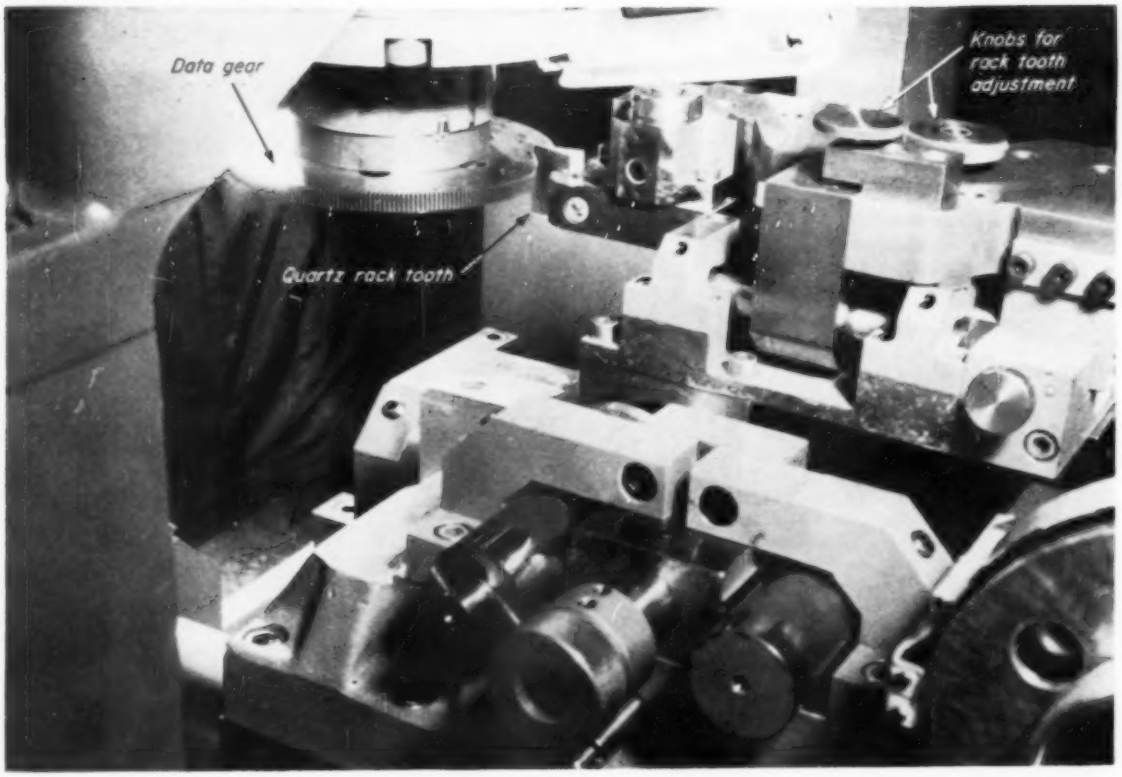


Heart of line-of-action dontometer . . .

. . . is shown above. Data gear is mounted on the same spindle as the theodolite. Collimator at right maintains zero reference. When the rack tooth is engaged with one side of the gear tooth, the inspector revolves the spindle, causing the rack tooth to travel tangentially and engage working involute profile on gear tooth. After the rack tooth has passed through the complete line of action, rack tooth is engaged with next tooth and procedure repeated. Inspector determines errors in data-gear by comparing theodolite position reading with nominal gear dimension. Position reading is readily determined within ½ sec of arc. Any size spur gear up to 10½-in. dia can be inspected by this instrument

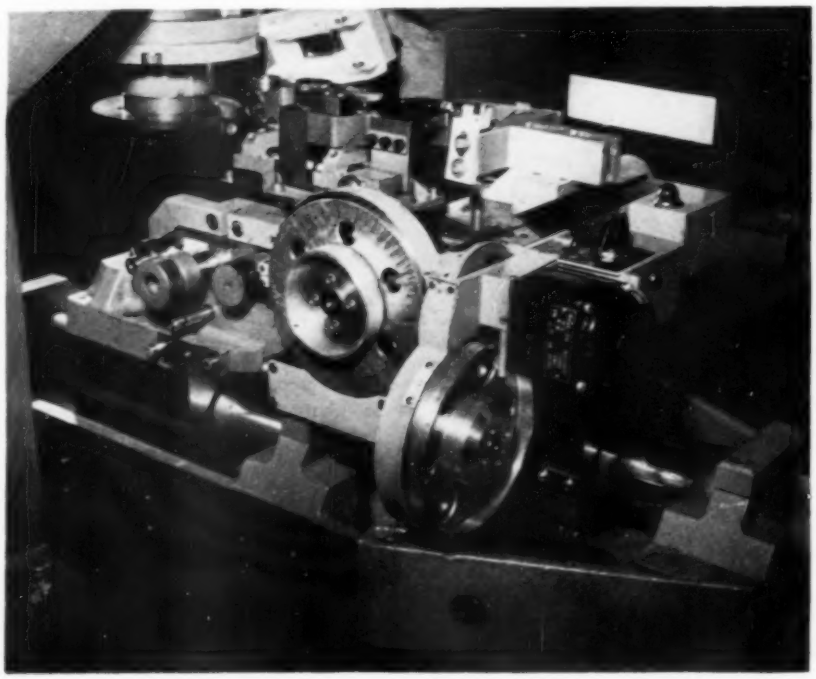
PLEASE TURN PAGE ►

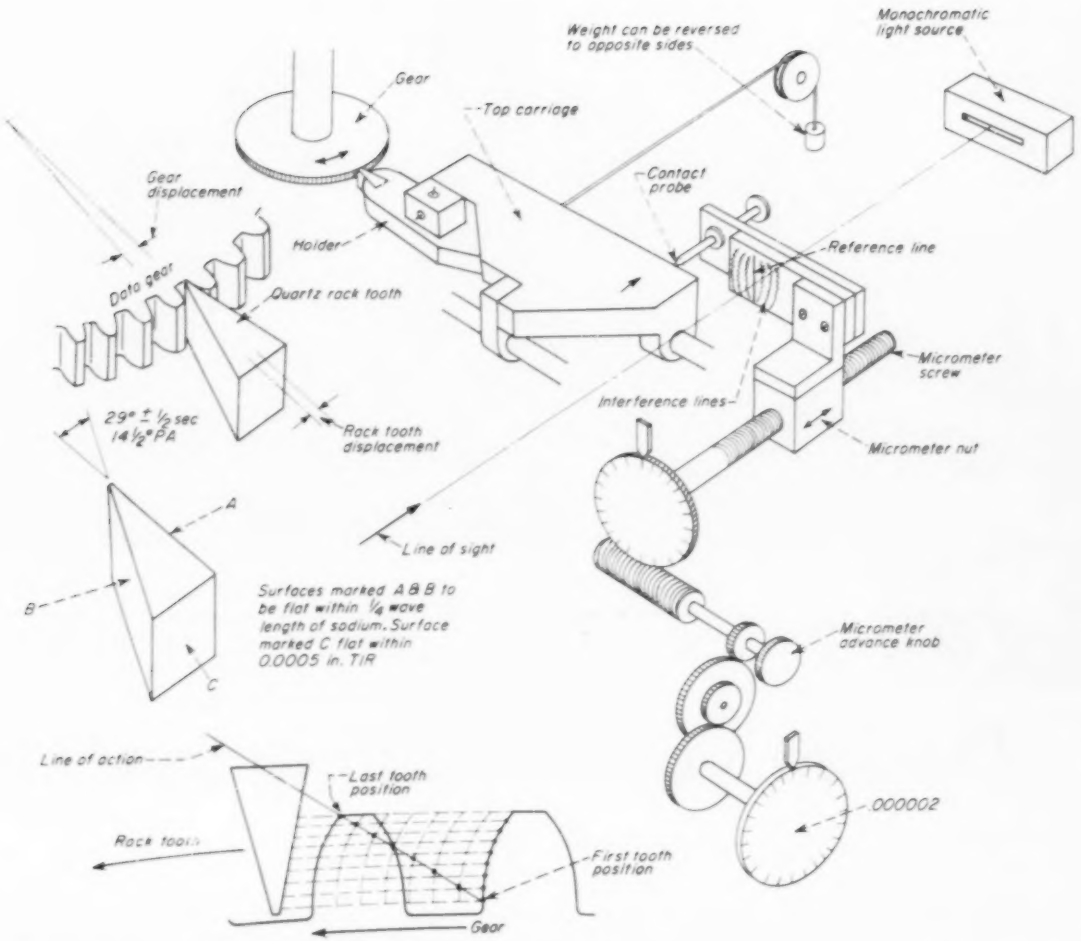
Line-of-action dontometer . . .



Quartz rack tooth . . .
. . . has an included angle of 29° for 14½° pressure angle common to Sperry data gearing. Wedge angle is accurate to within ± ½ sec of arc. Rack tooth can be rotated and translated in three planes. Inspection of gear can follow any desired procedure, that is, check working area of involute profile in any increment and in any sequence. Once the rack tooth is in a fixed relationship to the gear, subsequent inspection of all other gear teeth is readily accomplished by simply moving the rack tooth tangentially. To pick up a new point along the involute profile the rack tooth is displaced linearly

Coordinate guide . . .
. . . translates on precision ball bearings caged and preloaded between hardened and ground steel bushings and shafts. Guide transports the rack tooth tangentially and radially with respect to the data gear. Micrometer screw is fixed to base of coordinate guide and does not translate with respect to guide tangential displacement. Micrometer screw is motor driven over long displacements. Coordinate guide base is Meehanite casting. Guide shafts are supported in three-point suspension end-blocks to minimize possibility of distortion





Maximum error from accumulative tolerances...
. . . within the dontometer does not exceed 1 sec of arc because of the inherent accuracy and quality built into the surface plate, alignment of three carriage guides, theodolite, micrometer-screw, and quartz rack tooth. Normally, total errors in data gears are inspected on this instrument to an accuracy of ± 1 sec of arc. The rack tooth is positioned tangentially to the gear with an optical indicator and a Moore leadscrew and nut. The optical indicator consists of two half-coated glass plates, and employs the principle of interference of light-bands. Indicator permits prepositioning of rack tooth to any desired reference point. Its basic accuracy is better than ¼ wave length of light, and with a mercury-light source it can reposition rack tooth within 0.000002 in. of reference position. An auto-collimator is initially used to align the rack tooth with the gear. Knobs on the rack-tooth holder provide a convenient 3D method of adjusting the rack tooth normal to the gear-face

Data gear mounting surface . . .
. . . is flat within 0.000030 in. Holding fixture has corresponding flatness and parallelism. Data gear is centered on inspection spindle with respect to proof diameter that is round within 0.000020 in. Rack tooth engages full face width of gear but can be adjusted to engage a portion of face width. Theodolite bridge is Meehanite; heavy cross section and ribbing are for extreme rididity

Interior design of plants . . .
is of tremendous concern to the MH engineer. He will have very definite ideas on ceiling heights, window arrangements, floor capacities, and bay sizes, as well as many other features that are decided upon in the blueprint stage

Design your handling system

DONALD W PENNOCK, facilities planning engineer, CARRIER CORP, SYRACUSE, NY

In your building programs, where does your materials-handling man enter the picture? All too often in the past, his experience and advice have not been taken advantage of in company planning for new facilities. The thesis of this article, which differs sharply from traditional concepts of what the handling man is supposed to be, recommends that the MH manager be one of the most indispensable men in his company's future building programs—both before and after plant expansion

The design of a materials-handling system to suit a building involves much more than the handling equipment itself. When a handling system has to be designed *after* the building has been erected, the loss in efficiency can be staggering.

Today General Management, considering plans for building acquisition, construction, or utilization, is primarily interested in those broader aspects of the materials-handling man's work that are concerned with the most economical and efficient operation of the organization as a whole. This interest is reflected in management decisions on size, location, quantity, and cost of such facilities as parking lots, trucking plazas, railroad approaches, manufacturing plants, and office buildings.

General Management desires engineered, integrated movement of traffic, materials, goods, personnel, services and communications. It prefers a master design that integrate handling for each building.

SELECTING THE BUILDING SITE

As preface to a discussion of materials handling on this broad level let's assume that production requires better, larger buildings; that plans for subcontracting the increase in production have been discounted; and that a decision had been made to build, purchase, or rent the desired space.

In what areas can the materials-handling engineer or manager make suggestions and contribute to the guidance of management in site selection? This consideration is very important, because site selection seriously affects the economics of any handling system he designs for product manufacturing.

His transportation background can certainly be used extensively in reviewing the advantages of railroads, motor trucking, waterways, airlines, buses, and roadways in the area. His knowledge of cargo rates is valuable here.

His next concern would probably

Outside handling problems . . .
extend far beyond the mere carrier itself. The MH man should be a key member of the team that plans plant roadways, building approaches, railroad terminals, and outside storage areas

to suit the building

be with the amount of ground and floor space available in various properties and the possible arrangements for most profitable flow through grounds and buildings. This study would lead him to examine prevailing construction costs and types of available buildings, because their amortization constitutes a burden that affects availability of future funds for materials-handling and flow operations.

Here he might reconsider pavement planning requirements, change a road from rigid to flexible pavement, or decrease its width to help lower costs. He might elect to reduce his internal storage space, perhaps suggesting a building wall that would permit economical storage-area building expansion at a later date. He might suggest double-deck crib tiering, with mezzanine grating floors, to reduce ground-floor costs. He certainly must indicate what steel structure or beam arrangement he requires to secure flexibility in overhead conveying systems, for many designs that might be applicable today just won't be suitable for future operations. There is literally no end to this adjusting of planning to derive profitable flow with minimum burden.

Our MH man is certainly interested in the available labor. He wants to know what kind of work local people are accustomed to, and what technical training is available in local schools, for their skills may substantially affect the handling of his materials and the control of his systems. His work has exposed him to the influence that labor organizations and contracts may have on the continuity and profitability of materials flow, and he investigates these phases of his work.

Today the experienced MH man also has a far better conception of plant service requirements for his equipment and is able to list electrical and mechanical requirements for powering and serving his equipment and systems. He wants to know about water, gas, electricity, fuel, and sewage facilities. All this information is also useful to his plant engineering associates, who are seeking to determine overall service load requirements.

One of his principal concerns is the location of material supply sources. Detailed knowledge of how materials must be handled between the vendor's locations and the company's building sometimes can determine which site to select. In this area as well as the others, the MH man can help General Management to select the most profitable site.

BRINGING MATERIALS TO THE PLANT

When his company has selected a site, the MH manager really gets down to the business of designing his integrated handling systems. He is now faced with the combined problem of designing and selling separate systems to his fellow sales, production, service, personnel, and engineering managers, and a single integrated flow arrangement of the separate systems to his General Management.

The design of a system to suit a building starts with the raw material back at the vendor's plant. Here unit loads and bulk loads are specified for transportation to a building with consideration given to size, weight, strength, and cost of packaging. For example, I like to receive steel sheet in 5-ton unit loads, which are easily handled by automatic grabs and positioning equipment on and off trailer trains, in storage and in metal forming.

Next the carriers and their routing to the plant site are specified. Here the MH man must consider the approaches to his company's buildings. If railroad approaches are used, he is interested in layout, switching arrangements, and ground storage space adjacent to tracks and buildings. He must specify industrial trucking and crane facilities for unloading and handling materials outside the buildings. He must determine if the soil in his outdoor storage space can sustain all-weather traffic: Should the soil be used "as is," or should another surface — gravel,

crushed stone, blacktop, soil cement, concrete—be provided? For instance, where sandy soil is prevalent and a hard surface is required, a mixture of cement in the surface soil can produce a pavement that will sustain very heavy loads; light bombers have been landed on such pavements.

The MH man must also weigh costs against needs for such storage-area features as drainage, lighting, landscaping, and maintenance. These costs should, of course, be decided chiefly on the basis of sound engineering economy, as should all his decisions.

TRAFFIC CONTROL

In selecting road approaches, the MH man will find that his integrated handling system is a decisive factor in what facilities are provided. His first concern is the proper deceleration of trucks and cars off city or state roads and onto the company's private roadways or plazas. I have found that guards at deceleration-lane paper checking stations speed up flow of materials to docks by directing inbound trucks to their proper building destinations and by precluding vehicles which have no business on company roadways. This makes the entire operation much safer for both company personnel and the general public.

Acceleration lanes and discharge times are important factors in the MH man's planning. So are traffic signals and control equipment. For example, in one critical area the use of magnetic detectors was necessary to secure state approval for traffic lights that would permit discharge of MH trucking into a 50-mile speed-limit zone.

The next task of the MH man is to eliminate traffic problems involving passenger cars, industrial trucks, and over-the-road trucks on the company's roadways. Here his extensive knowledge of flow, and his intimate knowledge of the roadways over which the materials will move to production buildings, enable him to select, size and design a suitable flow pattern.

He is concerned with the width, type, and construction of roadbeds and pavements that will carry heavy trucks with minimum pavement maintenance. He designs dockside plazas to suit the weather, the traffic, and the timing of his flow. I have found that a plaza 90 feet deep from dock bumper to edge of plaza is a minimum requirement in Syracuse for excellent truck operations, although operations have been sustained on depths between 55 and 60 feet.

Incidentally, my experience has been that all types of approaches, plazas, and storage areas are more easily sold to management if the MH man has some knowledge of landscaping and screening. Knowing the costs involved in screening or properly setting off a MH system, and knowing what plants, trees, and shrubs will thrive, are "musts" in selling the boss.

Building design . . .
should take into account future handling problems, such as the installation of heavy, massive machinery. Here a whole section of a factory wall had to be knocked out to permit installation of a stamping press

TERMINALS AT THE PLANT

The next big decision in designing the MH system to fit a building, or buildings, is whether to terminate railroad and truck facilities inside or outside the building. This decision involves a study in economics to determine what building and operating funds are available, as well as a study of what effects such intangibles as weather, temperature, and dust will have on products and personnel.

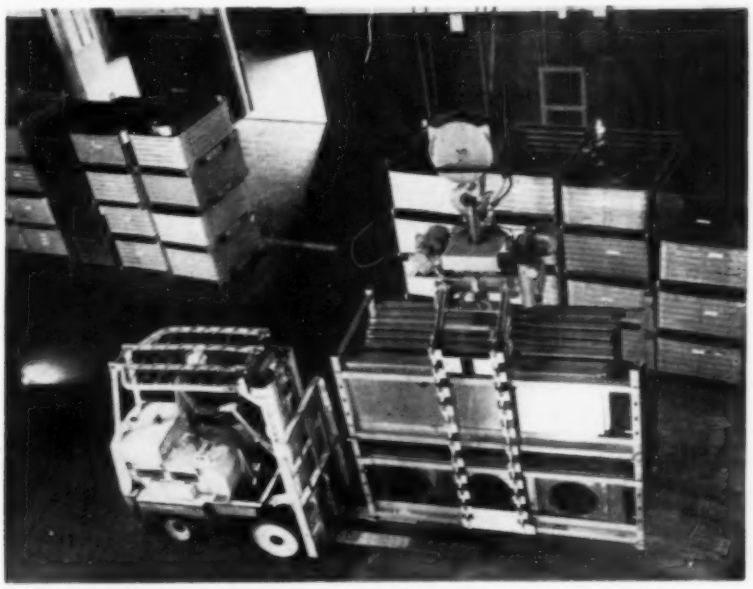
I prefer terminals inside buildings, if such terminals do not split existing floor space, or split space reserved for future buildings. But there have been many times when I could not conscientiously justify terminals inside a plant building.

HANDLING INSIDE THE BUILDING

Assuming that the MH man has studied his product thoroughly—as well as the metal forming, welding, painting, assembly, and other processes that go into its making—his next consideration is product flow, handling, and expediting within the building.

Suppose that our building will accommodate several products, each having a dozen sizes and models, with hundreds of variations in paint, hardware, electrical characteristics, and the like. This type of problem often forces the MH man to select a protoype of each main group of products, using these prototypes as the basis for his preliminary planning. He then crystallizes his final planning by checking the suitability of his proposed MH system for handling the

Central radio stations . . .
provide an efficient and economical means of directing the flow of mountains of material through productive processes



Overhead, floor, and positioning systems . . .
must mesh efficiently wherever they meet. This designed integration of systems is best accomplished when the MH man is as vitally interested in building construction, services, and layout as he is in the design of the material-handling equipment itself

other product models and types that will be processed.

As he progresses with the preliminary design of the components of his flow systems—whether they be unit-load transport, power-and-free conveyor storage, final-assembly conveyor lines, or any of a host of other possibilities—the MH man and his manufacturing and product-engineering associates are confronted continually with decisions to be made: changes in methods, product-mix schedules, quantities of materials to remain in storage or processing, labor requirements, space relationship of major production functions, and the like. At the same time, he and they must design several specialized service systems that are essentially of a handling nature, and that are of utmost importance in obtaining smooth functioning of the product handling system. Here, for example, I refer to the design of mail systems to serve a building; to the design of food handling and dispensing systems; and to the selection of proper elevating equipment for multi-story office buildings.

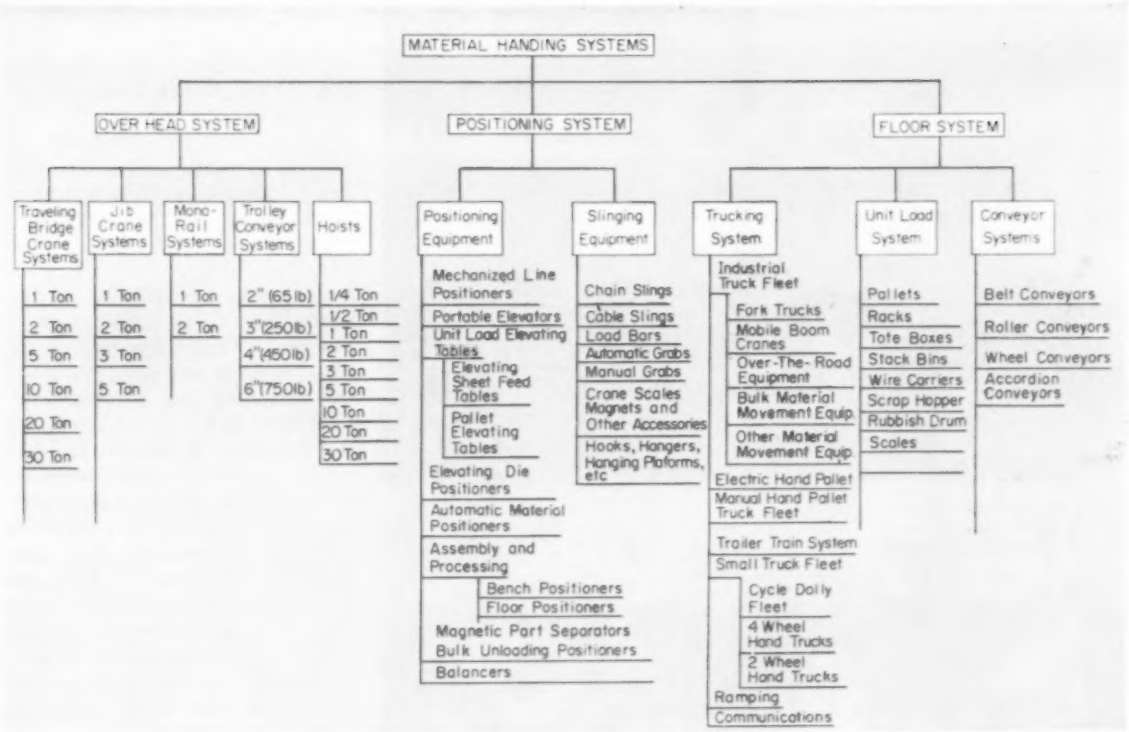
To further illustrate this very important phase of an MH man's work, it might be noted that in designing a food-handling system the MH man begins by recommending suitable docks and dock equipment for unloading and loading foods; food carts and portable equipment for transporting and storage purposes; pass-thru and lowerator equipment for china handling; conveyorization of trays; and mechanization of bussing and dishwashing operations. Probably one of the biggest services which the MH can render to General Management in this work is in decisions as to whether serving lines or shopping-center-type food dispensing is most suitable.

The MH man often is more concerned than any other manufacturing man with engineering radio systems for industrial trucks, cranes, and storage centers. In research and laboratory buildings, he can assist in providing the usual monorail, truck, and crane systems, as well as the complex mechanical positioning hands and other special handling devices that are required. His approach to these specialized areas (which is just as important to integrated handling for the whole system as, say, his work with power-and-free conveyors) is very similar to that which he takes for manufacturing.

MH PRODUCTION PLANNING

My work has been with both high-production and heavy job-shop products, which for proper handling have required many sizes and types of buildings. In general, the best results in my work have been obtained in buildings with floor capacities of 200 to 450 lb; bays from 30 x 30 ft to 40 x 60 ft; roofs and columns capable of handling heavy snow loads, plus jib, monorail, or traveling-bridge cranes ranging from 1 to 30 tons in lifting capacity; working ceilings

Design your handling system . . .



Materials-handling systems . . .
in a plant should be organized efficiently. This plan breaks down all handling equipment into three systems: overhead, positioning, and floor. Chart helps greatly to familiarize trainees with company's handling setup

from 14 to over 40 ft high; and straight production-lines ranging to almost 1000 ft long. Time after time, materials-handling economies have been deciding factors in sizing building bays, ceiling heights, floor capacities, structural members, and services.

When the plan of a MH system for a manufacturing operation has been accepted by General Management, the MH equipment components and requirements must be specified. When equipment is selected, primary consideration is given to several factors: minimizing and standardizing the equipment in the buildings; selecting equipment that can be expanded or allocated to all factory areas; reducing equipment dead weight; mechanizing or automating equipment where economical; providing for direct labor or mechanical loading of unit loads in form utility areas; assigning or allocating specific equipment to specific tasks; and making possible the easy identification of the capacity of any equipment item by any worker. Assistance in the actual design work can be obtained from local MH engineers and material-handling vendors. Most of the latter are pros of long standing, and many are, or have access to, professional engineers specializing in materials handling.

To obtain equipment usage that will fit my requirements, I prefer to break all equipment down into three categories: floor, overhead, and positioning equipment. These groups are sub-divided into specific items, as shown on the chart reproduced above. There are sometimes, of course, a number of special items or systems which must be added to the listing, depending on the processing involved.

To this list of selected equipment are added the following factors required for each item or its proper operation: power, communication, controls, alarms, air conditioning, ventilation, heating, plumbing, sprinklers, and structural support or layout. Here the MH man should also list his estimated future requirements, which will insure expansion of his flow lines unrestricted by inadequate or improperly located services.

The complexities involved in designing a profitable MH system to suit a building are staggering. This design work is a team job that requires the attention and contributions of all the top men of management. It can best be coordinated by an MH man of management status who has been trained to look for ways to save money wherever movement is involved in a company's business. The work results in maximum returns when a system is designed that properly integrates all movements of every character to, through, and from the building. Such a system demands that the MH man be actively interested in site selection, transportation, plant approaches, services, building construction, manufacturing centers, special systems, warehousing, shipping, and a multitude of other areas.

Round Table...

Advance Notice

***SHOULD** a company give as much notice as possible when layoffs are necessary? Would this consideration, plus the real reasons for the layoff, tend to make the employees loyal? Your opinions may help others. Discussions of earlier topics start on page 174.*

"Here's one for the foremen's meeting tomorrow night, Ed. I was talking to an old friend the other day, and he says his company always gives advance notice when there's a layoff coming up. He says it's good for morale."

"Sure, Al; I can see how it would be. Most workers would rather be as miserable as possible during the last few days they were going to bring home paychecks. Why don't you try another one on me?"

"No; I really mean it, Ed. If the company established a policy of telling the men a week ahead of time when a layoff was due, it would give them time to look around for temporary jobs or start saving money."

"And give them a chance to line up permanent jobs elsewhere, too. I can think of a lot of objections, Al. How about the throatcutting it might start when everybody in the plant started jockeying for the jobs that weren't going to be laid off?"

"That's strictly a matter of seniority, Ed, and it's no contest. The important point is that the employees realize that the company is concerned about them, even though it might have to shorten the work force. The company could also tell everyone just why layoffs are necessary, giving the true business reasons. That should cut out a lot of bad rumors."

"All I can think of is everybody starting to stretch out the available work as soon as they hear about the cutdown. Production would drop to zero, Al."

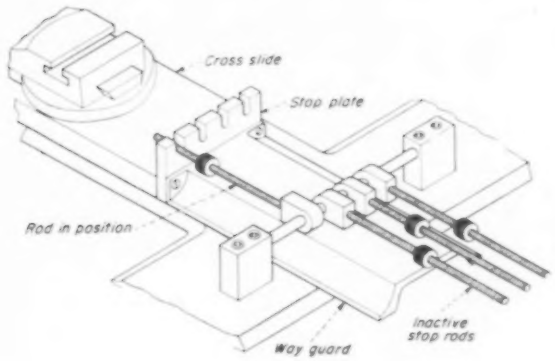
"I don't think so, Ed. I think once the practice was established, the effect would be to improve company-employee relations a lot, especially if the company gave out the full reasons for cutting back."

"Even if the company gave notice, Al; how about a sudden layoff when the company doesn't get advance notice itself? That's happened once in a while. The result would be real resentment from the workers. And you couldn't blame them a bit."

"I guess you don't like the idea, Ed; but I'll bet any worker would. It would at least give him a little time to adjust."

Practical Ideas

Lathe Cross-Slide Depth Stop Has Many Positions



There are many operations performed on a lathe where a multiple position stop is useful. We use the one shown on conventional lathe work in conjunction with a square turret toolpost on the compound.

The method of mounting such a stop will depend on the type of lathe on which it is used. Our lathe has a protective cover screwed to the back of the cross-slide to keep chips out. We use the same screw holes to mount a notched stop plate between the cross-slide and the cover.

The cross rod which carries the threaded stop rods is secured to the back of the carriage as shown. To use the stops, the rods are swung over into their respective slots and the nuts are adjusted to the depth desired for the corresponding tool.

Clifford Molloy, Bronx, NY

Expanding Dual-Carbide Toolbit Hurdles Tooling Obstacle

When workpieces running into quantities of thousands require slots of standard cutter sizes there is no problem. But when such a job calls for slots of approximately 100 different widths, tooling can become very perplexing, particularly when tolerances are +0.002 in., −0.000 in.

We were faced with just this situation recently. We had to cut slots ranging from 0.375 in. to 1.250 in. wide in aluminum parts, to the limits mentioned. Straddle mills and end mills were first considered, but they would have added a prohibitive cost to the job. One reason for this was the many sizes that would be needed, and the other would be the difficulty in holding sizes during resharpening. The large radii in the corners of the slot also helped to rule out milling.

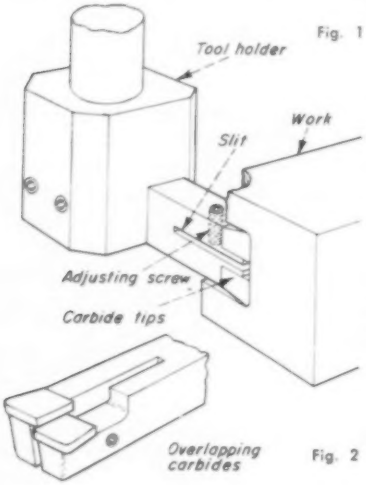


Fig. 1

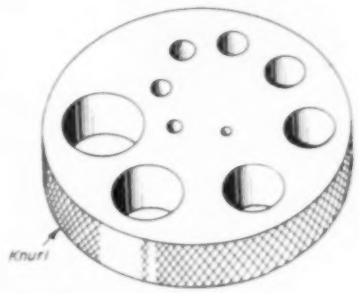
Fig. 2

The type of tool shown in Fig. 1 solved our problem. These tools can be adjusted to expand up to 1/16 in. Fourteen tools of this design covered the complete range of our requirements.

The shank of the tool should be of a good grade steel to provide sufficient strength to each side, once it has been slit. A hole is drilled and tapped through one side of the shank into the slit to receive a small headless setscrew. This setscrew bears on the opposite leg, and when tightened expands the shank. Carbide tips are then brazed to the extreme corners of the legs, after which they are ground to prescribed widths and radii.

As these tools were designed to finish the width and radii of slots, after the workpieces have first been roughed out, they do not remove metal from the center of the bottom. Should it be necessary to take a cut in the bottom as well as on the sides, a tool with overlapping carbide tips must be used (Fig. 2). Held in a suitable arbor, the tools are used as flycutters with the work clamped on its side on the milling machine table.

S S Milardo, Middletown, Conn



Guide Block Prevents Tap Breakage

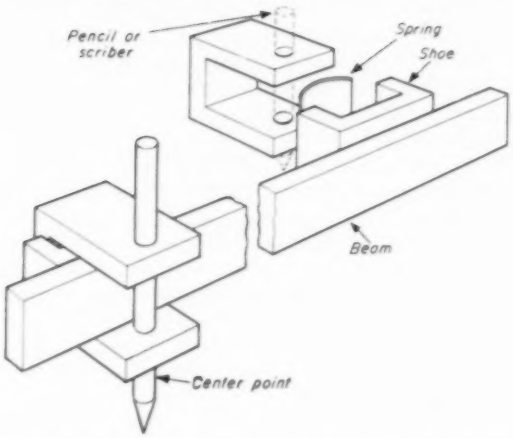
Taps of the smaller sizes are in frequent use in instrument work. These range from 0-80 to ¼ in.-20 and are almost always used by hand. Because of the weakness of numbered taps it is imperative that they enter squarely into the hole. Any cocking to one side or another will cause a tap to bind and break.

To facilitate starting I made the tap-guide block shown. It is made of a piece of scrap tool steel, 2 in. in dia and about ¼ in. thick, with its periphery knurled for easy gripping. After all the holes for the taps I use are drilled, the block is hardened to 50 R_c Rockwell.

This block has made small-diameter tapping much simpler and has reduced tap breakage to a large extent. Although a broken tap is not impossible to remove, it's a chore that should be avoided, and this is one way to reduce tap breakage.

Glen E Price, Caney, Kansas

Sturdy Emergency Beam Trammel From Aluminum Scraps



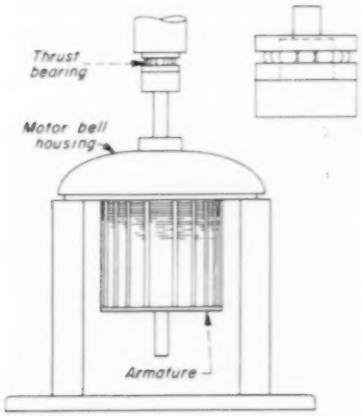
We recently had some layout work to do but found the capacity of our divider too small to handle the job. Not having any commercial beam trammel on hand, we devised the makeshift trammel shown which, incidentally, turned out so satisfactory that it has become one of our standard shop layout tools.

The various parts, except for a pair of springs, are made from aluminum pieces we had in the shop. A length of bar stock, ¼-in. thick by ¾-in. wide, makes up the beam. This is a fairly rigid material for the purpose, so beams quite long are possible.

Extruded aluminum channel, 1 in. by 1 in. with ⅛ in. material thickness, is cut into 4 lengths of ¾ in. each. Two of these are cut back in height to between 5/16 in. and ⅜ in. and serve as friction shoes. A 9/32 in. hole is drilled through both legs of the other two pieces to receive a center point and pencil or scriber. The center of these holes should be approximately ¾ in. from the back of the channel.

The two curved springs can be cut and bent from spring material or they can be cut from an old ¾-in. wide clock spring which already has the curve. In assembling the holders, the spring is sandwiched between the shoe and the channel piece. When pressure is applied on the back of the channel the points can be inserted and the trammel is ready for business.

M A Koleda, Hartford, Conn



Ball-Bearing Ram-Thrust Fixture

Pressing ball bearings in and out of housings should be done with care to avoid applying the press force to the balls themselves. In many cases this is impossible to do. The drawing shows such a case; an armature is here being pressed out of a motor bell housing. Force applied to the shaft is transmitted to both races as well as the balls.

The possibility of damaging the races by indentations or cracking can be reduced by rotating the bearing while pressure is applied. To make this possible, we have made up a rotating fixture for the press ram. It consists of a ball thrust bearing mounted on a short shoulder stud. The projecting end of the stud is turned to fit the hole in the ram. A housing can also be made to protect the thrust bearing and to make it a nonseparating unit.

Clifford Molloy, Bronx, NY

How to "Resharpen" a Wire Wheel

Many of the parts we turn out must have a brushed finish which we produce in a final operation. To get this finish a fine grade of wire wheel is used, and though the parts are made of soft metals such as brass and aluminum the wheel frequently "dulls."

To restore its efficiency, we apply a discarded abrasive wheel to the periphery and frayed edges of the rotating wheel. When we are satisfied that a new bite has been produced we reverse the wheel on the spindle.

John L Murphy, Conshohocken, Pa

Sealed-Bearing Check

When a sealed bearing is suspected of being noisy, a quick way to make sure whether it is defective or not is to mount it on a mandrel and hold it against a spinning wire wheel. Held hard against the wheel, the bearing will spin fast, showing up its defects. If the bearing is bad it will vibrate or rattle, or perhaps produce a singing noise.

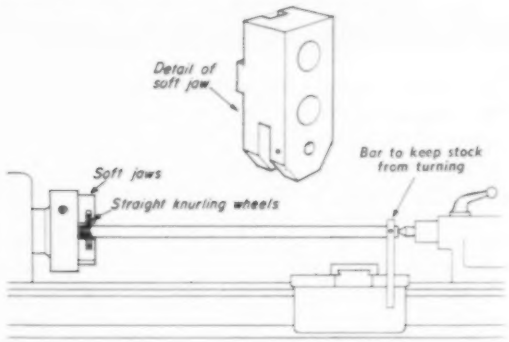
Harry J Miller, Sarasota, Fla

ANNOUNCING THE $100.00 GRAND PRIZE WINNER FOR 1957

RICHARD MINSER of Cleveland, Ohio wins with his idea: SPLIT RING STAYS ROUND originally published June 3, 1957

For details of the 1958 contest, see page 127

Practical Ideas



Chuck Knurls Bar Stock

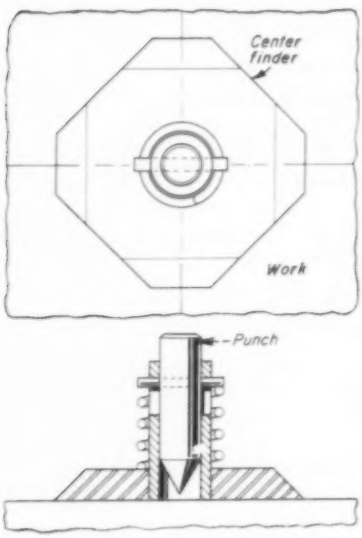
My job was to produce a straight knurl on a large number of disks, 1½ in. diameter by ½ in. thick. Instead of knurling each individual disk, whole bar lengths of the material was knurled and later cut off into disks.

A three-jaw chuck was fitted with soft jaws into which slots had been milled to take straight knurling wheels. The holes for the knurling-wheel pins were carefully located to make the wheels running true. The material was cut into lengths equal to the distance between the retracted tailstock center and the chuck. A piece of bar stock was secured to the work with a setscrew and allowed to rest on the edge of the lathe carriage to keep the work from turning.

Setting the depth of the knurls was done by tightening the jaws and rocking the chuck back and forth. When power was applied to the lathe at a good knurling speed, the stock was fed by turning the tailstock handwheel. The tailstock and carriage had to be moved along at intervals equal to the travel of the tailstock.

After a number of bars had been knurled, they were cut up into ½-in. disks and finish machined. Straight and uniform knurls were obtained in good time, and though I haven't tried a diamond knurl, the same procedure can be used as satisfactorily.

Claude Hawley Wingrove, Lincoln, Neb



Punch Picks Up Center From Scribed Lines

Errors in prick-punching two intersecting lines can be caused by several things. To name a few: The punch is not held perfectly perpendicular to the work. The hammer blow may send the punch askew. Mechanic's vision may not always be sharp enough to define actual line intersection.

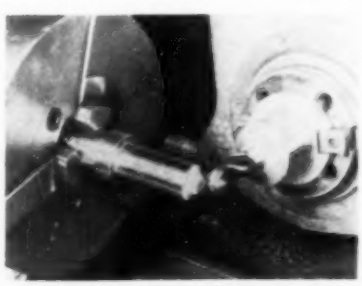
Because it is much easier to line up one scribe mark with another than it is to pick the center of two lines crossing, I designed a simple yet efficient marking tool that works on the single-line principle. As can be seen from the sketch, the tool is a guide-mounted punch whose base is a line finder.

The guide and base can be machined from one piece, or it can be made by pressing a guide bushing into a separate base, as shown. The accuracy of the tool depends on the care taken in locating the scribe lines. These are best produced in a good dividing head. After the guide has been bored and the bottom of the base faced, which should be done in one setup, it's an easy job to engrave four sharply defined lines on the bevel of the base after the bore has been indicated. I made my base octagonal, but it can be round or any other contour, just so long as it affords a good foundation.

A punch is machined with a 60° included-angle point and with a sliding fit in the guide bushing. A hole is drilled diametrically through the punch to receive a pin in a pressed fit. Two slots are milled 180° apart in the guide to serve as the transverse pin guide. A light spring keeps the punch retracted.

In operation, the tool is placed on the work with its signalling marks lined up with the scribed layout lines. A sharp blow with a light hammer is given the head of the punch, and a clean perfectly centered prick-punch mark is the result.

Federico Strasser, Santiago, Chile



Milling Replaces Form Turning

We often find it more convenient to mill on accurate radius on punches, die cores, and similar work than to grind up a form tool to do the job on the lathe. Besides being more convenient, accuracy is easier to achieve.

With an assortment of ball end mills (for various radii) and other forming cutters, for specific contours, it is a simple matter to set up work in the dividing head and rotate the workpiece against the revolving cutter, as illustrated.

H J Gerber, Stillwater, Oklahoma

Practical Ideas

ALEXANDER R GILAT
Haifa, Israel

won $25 in addition to regular payment for his idea:

EXPANDING RUBBER MANDREL
in the Nov 4, 1957 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

Our annual Production Planbook will reprint all winning ideas as a review. One will be chosen out of this issue as a winner of winners, and will receive a

GRAND PRIZE OF $100.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

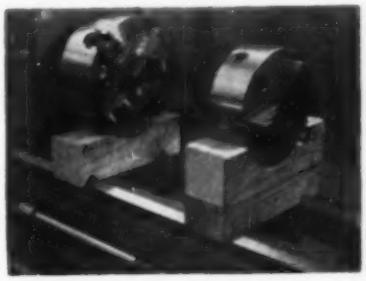
WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.

No Layout Fluid? Try Liquid Shoe Polish

Black or brown liquid shoe polish makes good layout fluid for use on soft metal like brass, copper, and aluminum. Scribed lines show up clearly, and when the job is done the fluid is readily wiped or polished off.

Stanley Clark, East Bradenton, Florida



Wood Blocks Ease Chuck Handling

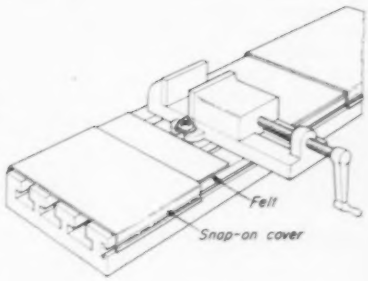
The above photo shows a pair of blocks we use when we install or remove chucks from the lathe spindle. They are efficient safeguards against crushed fingers and banged up lathe ways.

Well seasoned wood should be selected for these blocks. Hardwood isn't necessary, but if it is available by all means use it, the blocks will be more durable. For stability they ought to be at least as wide as the width of the chuck.

For the larger chucks one block may be high enough, but for the smaller, two blocks will have to be glued or bolted together. The size of the lathe will govern all dimensions. The bottom of the blocks are cut out to suit the ways whether they are V-ways, flat bed, or otherwise.

The radii or cradles are sawed out after they have been marked off directly from the chuck. Marking is done by placing the block on the ways with the side of the block touching the face of the chuck. A pencil is then used to trace the periphery of the chuck onto the block.

W W Anderson, Pasadena, Calif



Protective Covers Save Mill Table

Milling machine tables are, as a rule, always subjected to a beating caused by dropped hammers, wrenches, and other tools necessary to operate the machine. The result is that nicks and burrs are raised which must be stoned down before you can do a precision job where a workpiece is placed directly on the table.

To avoid this unnecessary destruction of an expensive machine table, and at the same time eliminate preparation time, I have made up protective covers out of 1/16 in. thick aluminum. They are made in two-piece sets to cover both ends when a vise or dividing head is used, or when a workpiece is clamped to the table.

One part of a set is a flat sheet as wide as the table and lined with felt on the underside. The other half is wider and edge-bent to snap over the edge of the table holding both pieces secure when in place. This allows the flat piece to telescope under the top piece for full protection of the table surface.

These covers not only keep the machine table in good shape but they also provide a good surface for placing tools and parts that would otherwise drop into the T-slots of the table.

I made these covers out of aluminum because it was available, but masonite or similar material can be just as effective. The time and trouble we took to make the covers was well spent for now we are assured of a good smooth table when it becomes necessary.

Glen E Price, Caney, Kansas

Model strip plater . . .
was built to demonstrate commercial possibilities of aluminum plating bath. A roll of the base metal in strip form is mounted at the left (A). Strip is drawn through successive compartments, where it is etched (B), rinsed (C), dried and plated (E), rinsed again (F), and dried (G). Metal is guided in and out of the plating bath by threading the strip over rollers through two rubber-edged slits (D) placed in the top of a closed glass tank containing the solution

Organic solutions are used for...

Electroplating Light Metals

Research at the National Bureau of Standards is being conducted in the refractory and light metals that look so promising for tomorrow's industry and defense. Here are results of experiments in the electrodeposition of these metals from various solutions

The National Bureau of Standards has succeeded in electrodepositing several of the refractory and light metals and their alloys from organic solutions. The metals deposited include beryllium and alloys of magnesium, titanium, or zirconium with aluminum. The deposits were produced by plating techniques developed for a program that sought means of electrodepositing metal coatings and electroforming the refractory metals. During the work, improvements have also been made in the NBS process for electrodepositing aluminum. Except for aluminum, the plating of the refractory and light metals is not yet commercially practicable.

RESULTS OF TESTS

The refractory and light metals have great potential, either as protective coatings on other metals or for electroforming. However, their deposition potentials are so far above hydrogen in the electromotive series that none of them can be deposited from aqueous solutions. The Bureau therefore decided to investigate fused salts and organic solutions as baths for electrodepositing these metals.

The best deposits of these metals were obtained from halides, hydrides, boro-hydrides, and organometallic compounds, dissolved in ether. Fused-salts baths yielded the metals only in the form of powder, flakes, or dendrites.

As yet, electrodeposits of pure titanium and pure zirconium have not been obtained from organic solutions. However, alloys of these metals were deposited from ether solutions containing complex metal compounds: titanium-aluminum (6% Ti), zirconium-aluminum (45% Zr), and magnesium-aluminum (6% Mg).

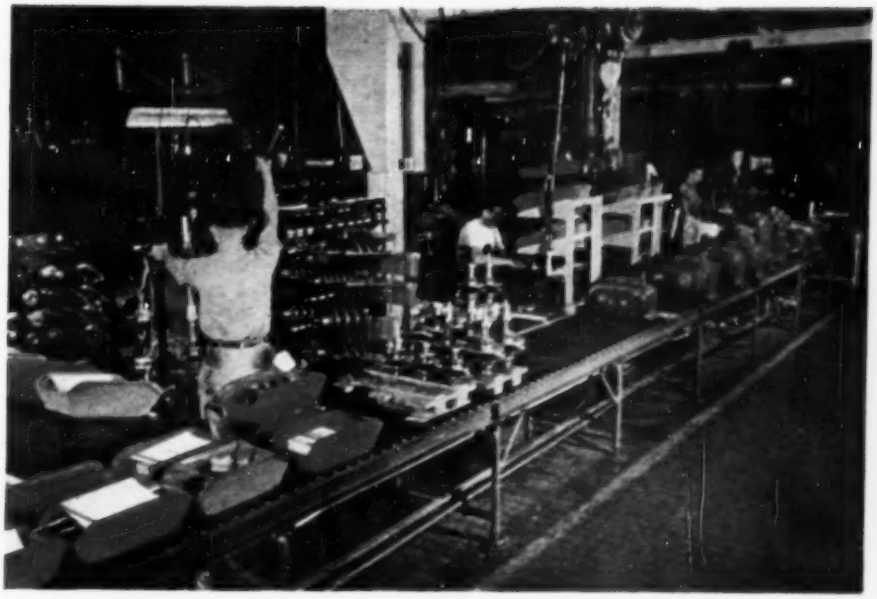
Coherent deposits containing 97% beryllium have been produced from an ether solution of beryllium halides and alkyls. A brittle, coherent alloy containing 70% beryllium and 30% boron was obtained from an ether solution of beryllium borohydride. Fine black powders of beryllium have also been produced by electrolysis of ether solutions of beryllium halides or alkyls. These deposits contain 92% beryllium.

Although smooth, coherent aluminum deposits from hydride baths have been produced at the Bureau for several years, recent improvements have increased bath stability and operating life as well as thickness of the coatings. Aluminum coatings with good adhesion have been obtained on a number of the common base metals, including copper and steel.

SOLVENTS AND SOLUTES

Before determining the plating ability of any solution, the Bureau obtained qualitative data on the solubilities and conductivities of a number of purified solutes and solvents. The ethers, particularly ethyl ether, were found to be the most effective solvents for organic plating baths. In general, the organometallics, borohydrides, hydrides, and halides were found to be the most useful solutes; a combination of two of these usually produced the best results. However, the most effective solute for each element is sharply selective.

An essential part of the program has been the preparation of complex metallic compounds (solutes) not commercially available. In some instances, new production methods were developed or improvements made for enlarging the yields.



Assembly line for PIV drives is part of modernization program that has cut assembly time 65% on the average. It is one step in a program that shows . . .

American Machinist

Special Report No. 455

January 13, 1958

How Link-Belt got a new plant . . . without building one

ANDERSON ASHBURN, managing editor

Link-Belt has many plants and most are new and modern ones, but when the engineering division for materials handling moved out of the Philadelphia Plant into a completely new building at Colmar, Pa, a big question remained as to the fate of the score of old buildings and the operations that remained. Working with their bootstraps, the local management of the plant developed a program of modernization, and sold it to the company. This program has changed not only the efficiency of the plant but the outlook of the people who work there, increased quality control, and improved the product.

Production capacity for enclosed drives has been increased 50% with a 2% increase in floor space at Link-Belt's Philadelphia Plant.

- Many orders can now be filled from stock and the on-time delivery of units of all types has gone up 8% in the last six months, is now at 87%.
- Lead time on machined parts has been reduced by more than half on the average.
- Time required to assemble the standard PIV (positively infinitely variable) drives has been reduced 65%.
- The whole appearace of the plant and the attitude of staff and workers have been transformed.

All these changes have taken place in a group of 27 old buildings that make up the Philadelphia Plant. The total cost of the program was about $1.5 million, but the savings in production cost justified the investment even if no weight is given to the improved quality of the product and the better deliveries to customers.

IN THE BEGINNING . . .

The conditions that existed were what might be expected following a long period of gradual growth under crowded conditions on a cramped building site. There were

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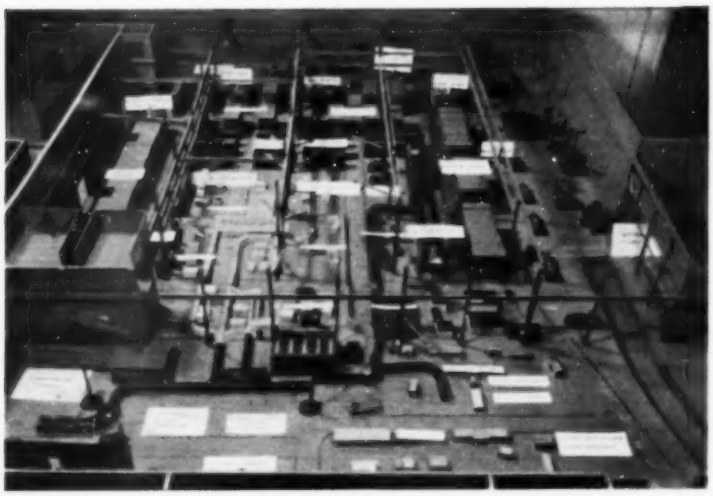
NEW PLANT

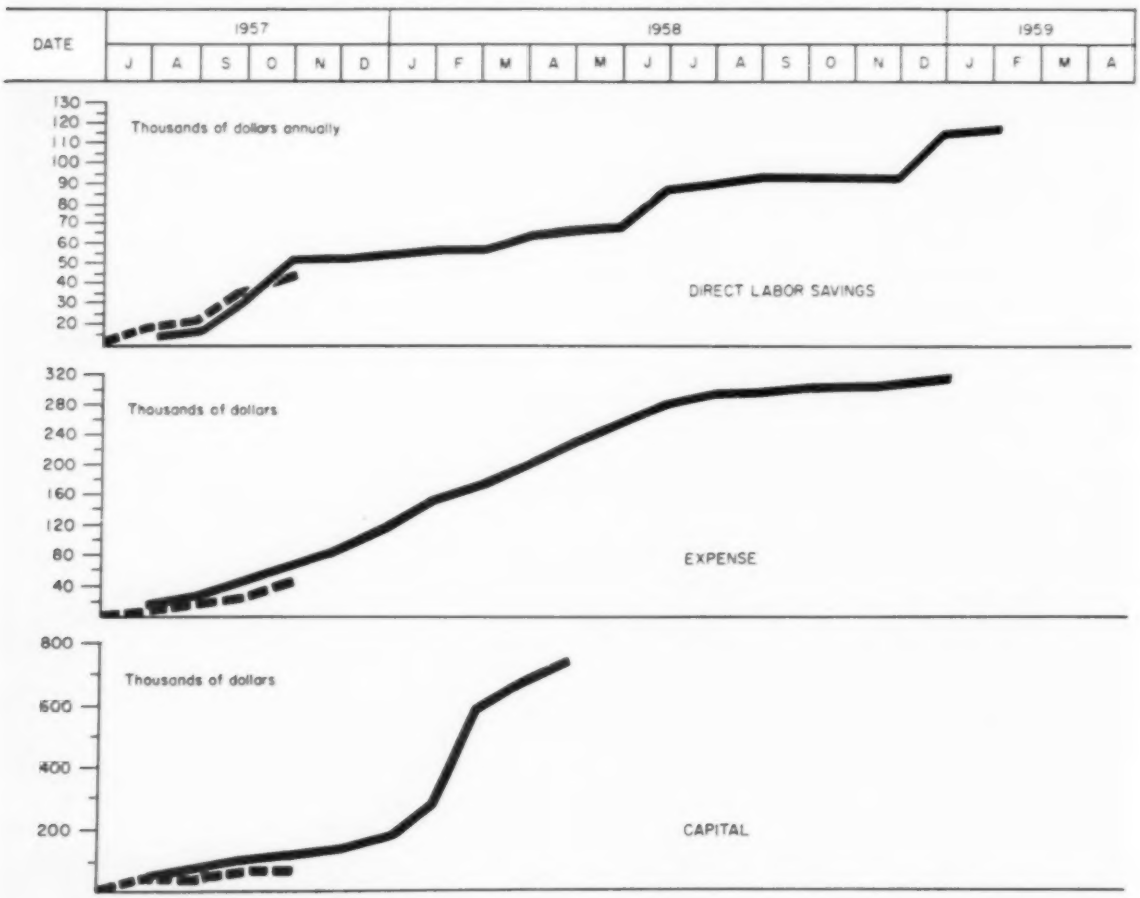
without building one...



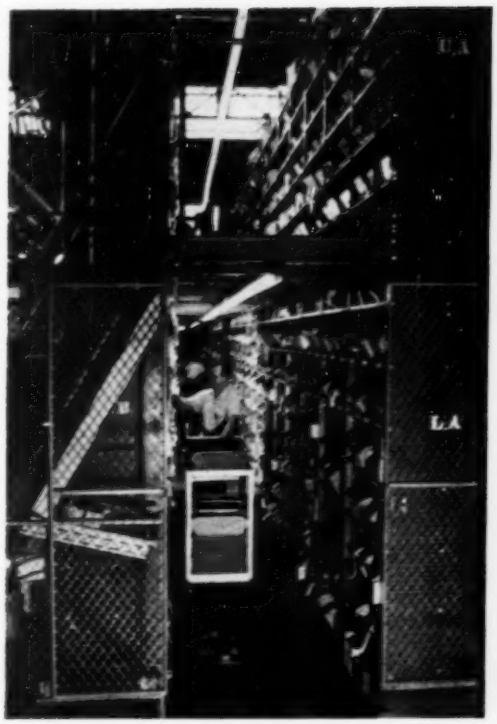
Scale mock-up of the first stage in the modernization program. Red is the PIV assembly line, orange the parallel-shaft line, pink the in-line helical line, light blue the worm gear line, dark blue the lapping area, and dark green is painting, packing, and shipping

Progress of modernization plan is plotted monthly against the estimate on this three-part chart. Solid line represents cumulative estimate, dotted line represents actual. These charts are for current phase, involving machining areas. Lag in actual figures behind estimates is result of late delivery of one major machine tool reducing both costs and savings. The three charts are not to the same scale

PROGRESS REPORT 1957–1958 PLANT LAYOUT PROJECT


DATE
1957
1958
1959
J A S O N D J F M A M J J A S O N D J F M A
Thousands of dollars annually
130 120 110 100 90 80 70 60 50 40 30 20
DIRECT LABOR SAVINGS
Thousands of dollars
320 280 240 200 160 120 80 40
EXPENSE
Thousands of dollars
800 600 400 200
CAPITAL

Storage racks are triple depth, 12 ft high, with gravity rolls on adjustable shelves. Racks are serviced by Automatic truck designed to operate in 8-ft aisles, lift to 12 ft



Assembly starts with hand picking of parts for an order by following the visual guide on the stock selection chart. Upper-deck storage has slow-moving and reserve storage

two major divisions operating in the plant and the opportunity to do something about it came when the engineering division for materials handling equipment moved to a new building at Colmar, Pa.

Three choices were open to the enclosed-drive department left behind. The plant could continue to operate as before, pulling warehouse stocks from various other locations scattered about the city into the vacated space, or there could be a modified warehouse plan with some rearrangement of existing operations, or there could be complete modernization.

The initial decision of the company was to adopt the modified warehouse plan. However, the plant engineering department was authorized to make a detailed study of a complete new layout and methods of operation.

A major incentive behind this study was that as sales had grown and models multiplied, more and more trouble was encountered in meeting delivery dates.

First step was to analyze present conditions in the plant. Major problems were found to be scattered locations of individual departments arising from a long period of growth and crowded operating conditions.

For example, the store rooms for enclosed drive parts were in six locations in three buildings. Assembly operations were in three locations in two buildings and testing was in three locations in three buildings. There was only one elevator to handle movement of materials between first and second floors of one building.

JOB-SHOP AUTOMATION

Operations were job shop in character because each of the six types of drives is offered in a large number of sizes, in many different gear ratios, and with a wide choice of other options. There was a broad interchangeability of parts, but each unit was completely assembled by one man working at one location.

From the first it was decided that modernization should not only eliminate the existing operating faults, but go as far as practical toward a mechanized straightline manufacturing set up. Plant engineering described its goal as "job-shop automation."

One of the worst examples of overcrowding existed in the machine shops, which were set up on a process basis. Because of the crowded aisles, it was often necessary to move a batch of parts to storage after one operation and then return it to the machine shop for the next operation.

Because the biggest gain in the shortest time, and for the least in-

Cost of modernizing assembly and stores Link-Belt Philadelphia Plant

Storage racks, bins, pans	20%
Conveyors, trucks, cranes, hoists	24
Assembly tools	4
Test equipment	9
Light, compressed air, exhaust	8
Relocation expenses	3
Building changes	30
Engineering cost	2

NEW PLANT

without building one . . .

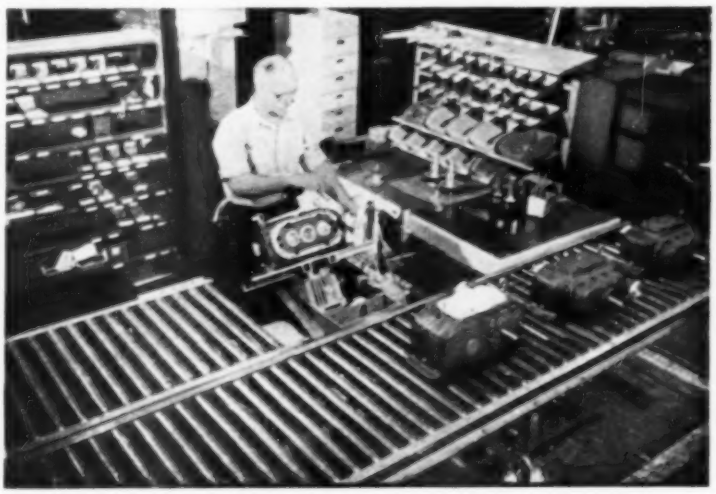
vestment, was promised in assembly and test operations, these were tackled first. Detailed motion studies were made of the assembly operations. To aid at this stage, a consultant in motion study was called in—the only outside help obtained in the entire program.

Studies of layout started with two-dimensional models and then went to a three-dimensional model, the final version of which is illustrated. An experimental stores and assembly area was set up to study various ways of dividing up the assembly of a unit, to test tools and equipment, and to develop layout of an assembly station.

From this study grew a proposal for complete rearrangement and modernization of the stores, assembly, test, and shipping areas of the plant. At the time the cost of the project was estimated at $275,000. A major part of this expenditure would be required for roller conveyors, cranes, hoists, storage racks, parts pans, industrial trucks, an added hydraulic press, and test equipment (table p131).

Based on the detailed plans developed, the pilot studies made, and the analysis of cost and savings, the management decided to put this plan into effect. Once it was started, certain changes were made in the plan to permit increased production, notably in the test areas, and these changes raised the total cost above the initial estimates.

First station on the PIV assembly line was carefully engineered with parts positioned and tooling and handling developed for basic assembly operations. A unit is assembled here in 23 min



Second station on PIV line is for additional work on geared, motorized, or other special units. Conveyor carries finished units to test area

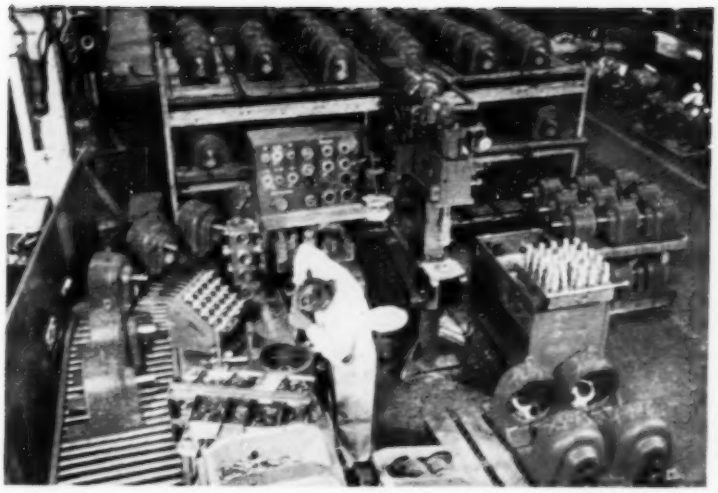
COLORED SELECTOR CHARTS

In the new layout, assembly is all concentrated in a compact area that is almost square with stores located in a big "U" around three sides of the assembly area. Four gravity roller conveyor lines lead through the assembly area and out the open end of the "U" through the test area and terminate at the paint-spray booth. From painting, a single conveyor carries the units to shipping.

Housings are stored in gravity roller conveyors, 12 ft long mounted in storage racks that are loaded from the outside and unloaded from the side next to the assembly area. Special parts are delivered from the machining lines to a special storage rack. Small standard hardware items are stocked right at the assembly stations. All other parts and sub-assemblies are stored in nesting pans in storage racks.

Fast-moving items are placed on the lower deck of double-deck storage area. For each model there is a stock selection chart which is simply a map of the storage shelves with each location from which a part is to be picked filled in in color. Marked above the colored square is a number indicating how many are to be taken from that location.

By using color to mark the stock selection chart, several variations on a basic model can be mapped on a single chart. The basic unit parts would be marked in red, and the parts for each option marked in a



Careful planning of assembly operations is shown in this station for assembly of low-speed gears at start of helical reducer line. Cabinet behind operator is heater to expand bearings before assembly in hydraulic press

Hydraulic jack replaces hoist to handle motor as it is assembled to gears and pinions, makes it much easier to position motor accurately and hold in position for assembly

single other color, so that the picker would pick all parts marked red plus all marked green, or yellow, or blue as specified by the order.

When an order reaches the assembly area, the stock picker takes out the proper stock selection charts and collects the right parts into nesting pans on a hand cart which he then wheels to the assembly area.

The PIV drives (a mechanical adjustable speed drive) are one of the most popular items and are concentrated on one assembly line. There are 181 parts in a standard unit. With eight standard sizes and options within each size, there are 2462 standard parts, not counting the many special gear ratios that can be obtained.

Three sub-assembly stations have been developed at which parts that can be assembled in advance are put together for stock. Thus the ten parts of the dial indicator (one size of which serves many models) are an advance sub-assembly. Altogether 12 such sub-assemblies are made.

One additional sub-assembly station is provided at the start of the line. Here the two shaft assemblies are put together. From this location the shafts go to the first assembly station where the basic unit is completely assembled. At the second station, motors, gears, and special controls are added as required for the particular order.

It used to take one man 2½ hours to assemble a PIV drive completely. Today, it requires 23 min for the basic assembly at the first station. To this must be added the time at the four sub-assembly stations and the second assembly station, but the average time saving per unit is about 65%.

The most difficult part of the training program fell at this point. Assemblymen, long conditioned to complete assembly of a unit and responsibility for its quality, were dubious that units on which several men worked could be any good. After one man had learned the key operations and was convinced that a unit could be assembled in 23 min, the new idea was accepted enthusiastically.

NEW PRODUCTION CONTROL

To permit assembly by these methods, a complete reorganization of the inventory and production control systems was required. The standard X-Y-Z categories were adopted for the stock rooms.

X items cost over $7.

Y items cost $2 to $7.

Z items cost under $2.

All Z items are bought in large quantities and go through double storage. IBM cards are used for the 50,000 parts in the X and Y categories, showing machining operations and time required. X and Y parts are being progressively alloted as the order comes through production control.

Inventory now runs nearly twice what it was before, but the sav-

Cost of Modernizing Machining Link-Belt Philadelphia Plant

Machine tools	54%
Installation (mostly electrical work)	6
Tooling	11
Materials handling equipment	5
Heat-treating equipment	5
Inspection equipment	3
Cleaning equipment	1
Building changes and moving costs	14
Engineering cost	1

NEW PLANT

without building one . . .

ings in manufacturing costs more than offset it and the faster delivery that can be provided becomes an important plus value.

Part of the increase in inventory grew out of the study of economic lot sizes. The aim used to be to figure a turnover of stock four times a year. Now a year's supply of a part may be made or ordered at a time. Or the amount may be for a much shorter period. On small housings, for example, the plant makes lots of 250 to 300 now instead of 50.

About three years were required to make the changes in assembly and control: One year for the engineering studies, one year for the procurement and installation of the equipment, and one year for the training of people and working out of bugs in the system.

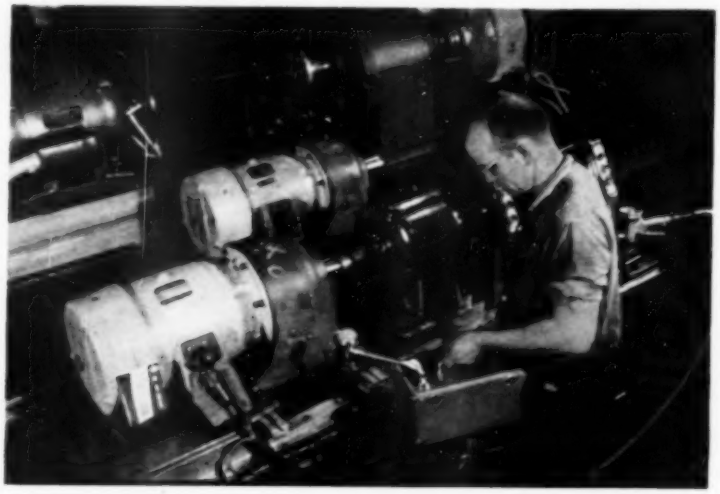
Early in the program, an important plus value began to show up: A new attitude began to permeate the entire plant. Everyone was suddenly full of ideas for further improvements.

11 MACHINING CENTERS

Following the success of the first stages, a proposal was made to realign the machine shops. The basic plan called for the development of 11 manufacturing centers, each aimed at nearly complete manufacture of individual parts within each center, with parts moving largely by gravity rolls through each center. Six of these machining centers will produce 90% of the parts.

To develop this part of the plan is requiring the rebuilding of several gear cutting machines and the purchase of ten new machines. The latter will replace 21 machine tools that are being eliminated. Total cost of the current phase of the program is estimated at a little over a million dollars and breaks down as shown in the table (p133).

Run-in test station has stations for four units, includes quick-acting clamps, oil supply and drain lines, and air lines for leak test. Drives for the test runs are built into the stand



During run-in test of gearmotor, General Radio sound-level meter checks noise in decibels. When a noisy unit is found, stethoscope is used to localize source of noise in the gear trains

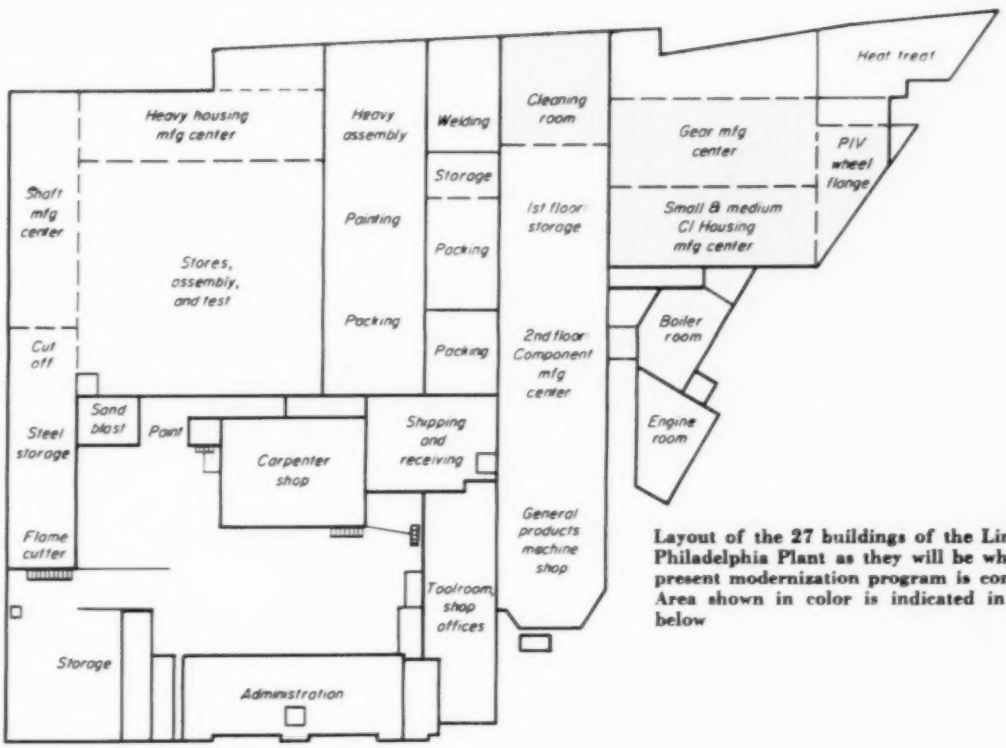
The changes in this phase of the program will increase production of the machine shop by 25%, provide more space for handling and still save nearly 6000 sq ft of floor space. (This space is intended for use on a new product.)

Because fewer machines are involved there will be less time and cost for setup and less handling will be required. Savings in handling come not through the reduced number of machines but because flow can generally be in a straight line through each of the machining centers.

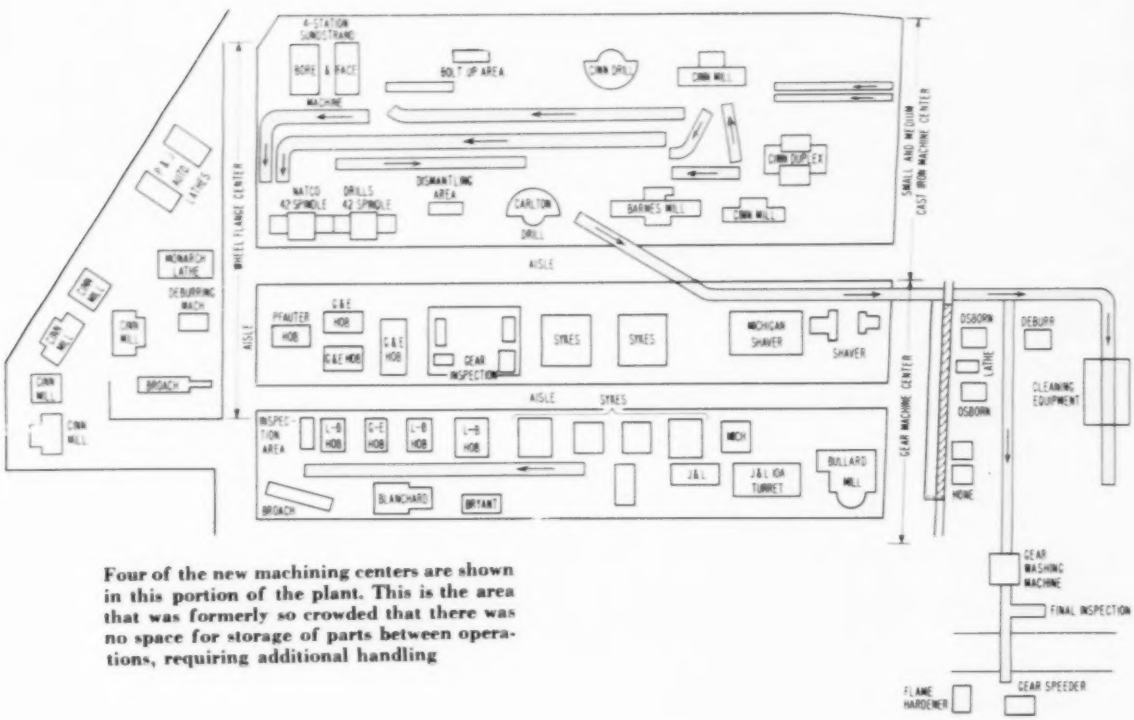
The new alignment will also permit further improvements in inventory and production control. Fewer machining operations result in less paper work, shorter lead times, and offer less chance for material to get out of the proper channels of flow.

Because the new machines are more accurate, and number of inspections required is reduced, better quality control is possible.

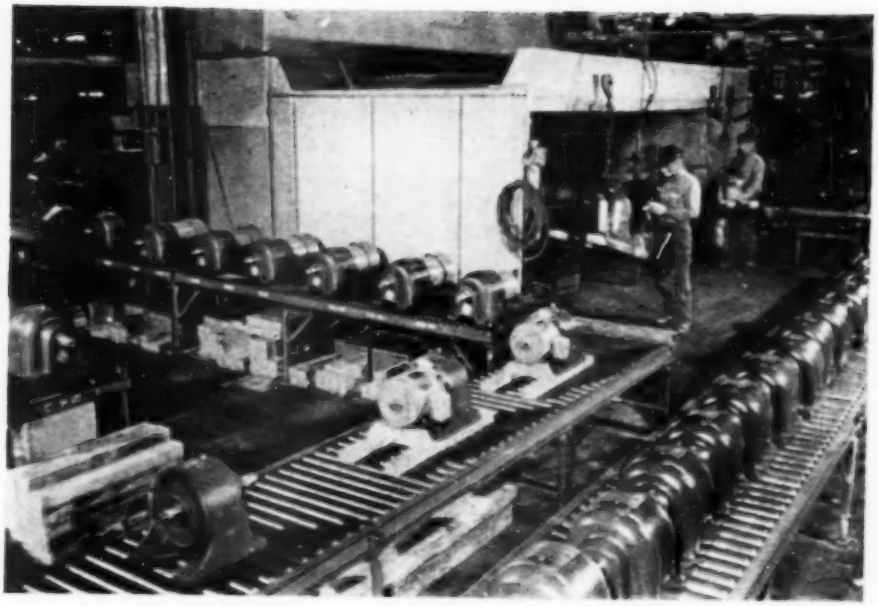
Finally, the clearly defined machining centers provide compact responsibility for supervision and serve as cost centers for improved



Layout of the 27 buildings of the Link-Belt Philadelphia Plant as they will be when the present modernization program is complete. Area shown in color is indicated in detail below



Four of the new machining centers are shown in this portion of the plant. This is the area that was formerly so crowded that there was no space for storage of parts between operations, requiring additional handling



Paint booth for spraying with lacquer-base paint is located at end of test area where conveyors converge. Painted units travel on conveyor in foreground to the packing area

NEW PLANT without building one...

cost control, estimating, and accounting.

The new machining centers are:

1. Small and medium housings
2. Shafts
3. Blank preparation and gears
4. Cast-iron components
5. Heavy housings
6. PIV wheel flanges
7. General products
8. Cut-off
9. Flame burning
10. Cleaning and deburring
11. Heat treating

Heat-treating is being enlarged by the addition of carburizing and flame-hardening equipment to the nitriding equipment already used.

Little change is being made in the wheel flange center. These flanges are the heart of the PIV unit and are cut on Cincinnati mills equipped with special oscillating fixtures. The specialized nature of these operations led to their being grouped into a machining center long ago.

An objective of the program is to reach the point where orders for all of the more popular units can be filled from stock. With the tightened production control, 87% of deliveries are now made within one week of the promised date. This has gone up 8% in the last six months.

With the completion of the present modernization program during 1958, the basic aims will have been accomplished. But already ideas are pouring in from the men and it seems a safe bet that the Philadelphia Plant will soon be proposing further spending to speed service and cut costs. Plant engineering is already talking about a higher speed painting setup and additional machine tool replacements. Because Link-Belt shows every evidence of liking the new life in its Philadelphia Plant, and of encouraging the new ideas, the end of this particular Philadelphia Story cannot yet be written.

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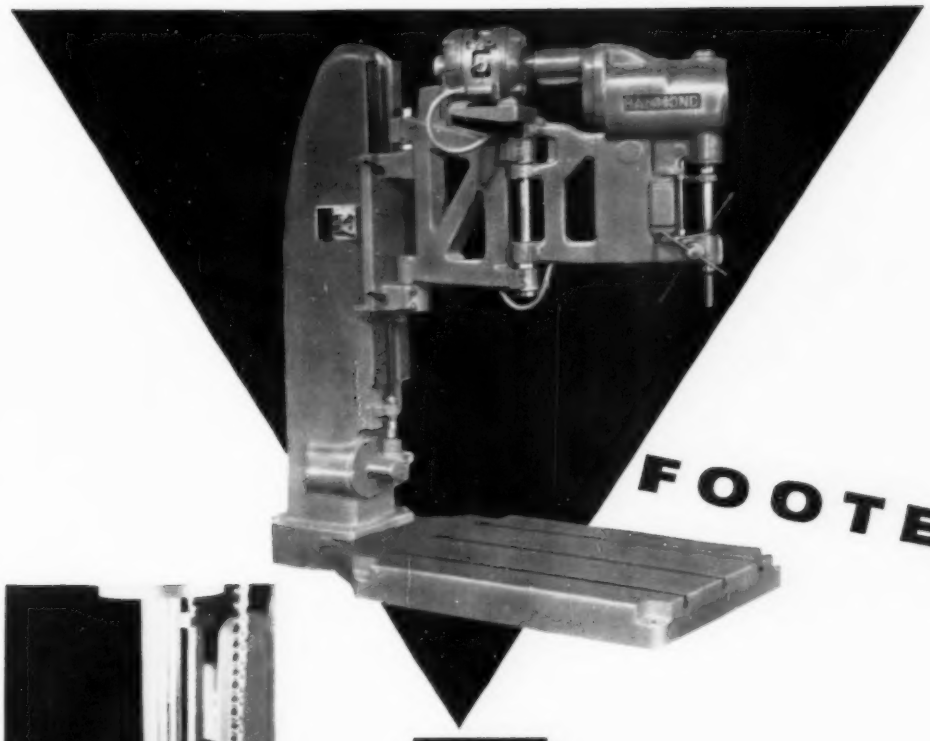
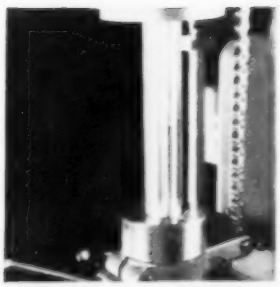
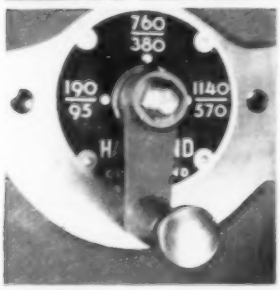
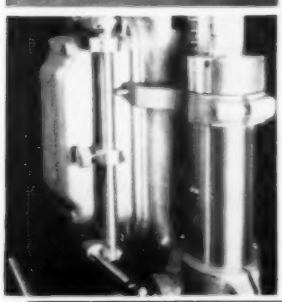


FOOTBURT







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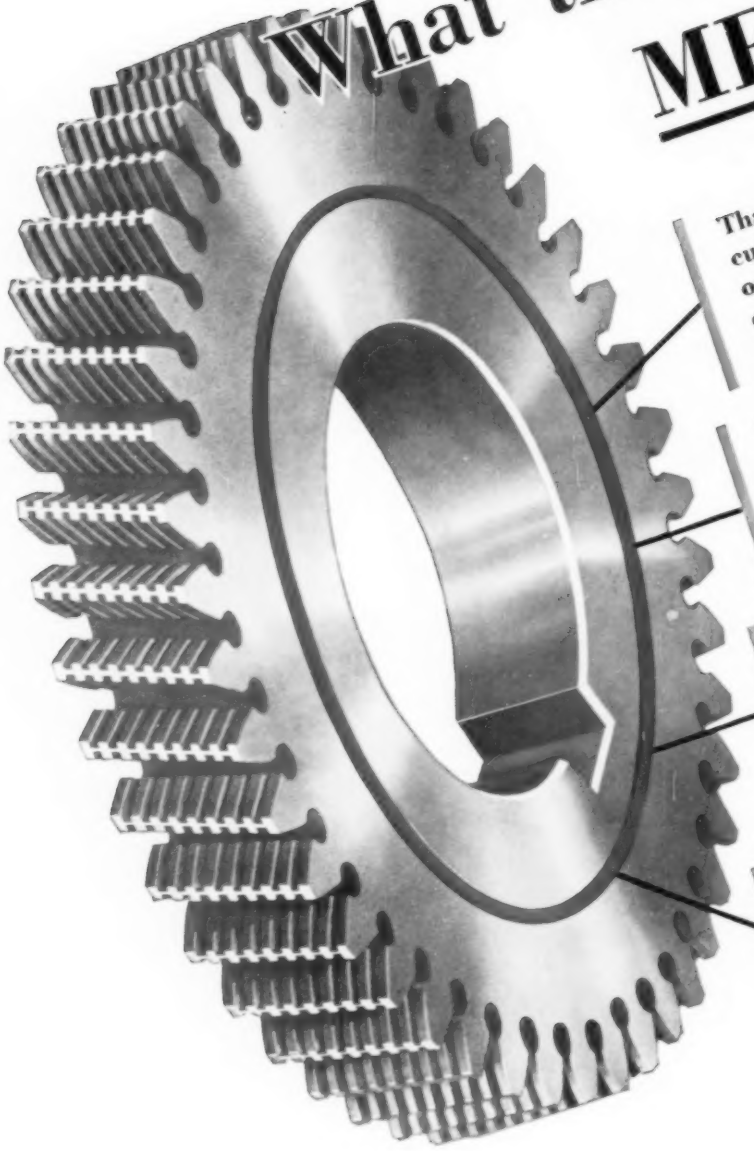
ENGINEERED FOR PRODUCTION

FOOTBURT

MACHINE TOOLS

American Machinist REFERENCE BOOK SHEET

What that Red Ring MEANS



That Red Ring on a gear shaving cutter means it was made by an organization which has more experience and success in this field than any other in the world.

That Red Ring marks the product of engineers and shop men who devote all their working time to these CUTTERS — nothing else.

That Red Ring reminds the user that these specialists are ready to help him get off the hook if he runs into a troublesome gear problem.

That Red Ring says "This cutter is designed and manufactured to deliver the best possible shaving performance."

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ORIGINATORS OF ROTARY SHAVING
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7968

Mountings for Abrasive Disks . . I

Source: American Standard ASA B5.35—1957, published by the American Society of Mechanical Engineers, New York 18, NY

The standards included cover the mounting specifications for grinding wheels referred to by many names and designations such as disk wheels, steel-back abrasive disks, plate-mounted wheels, nut-inserted wheels, and bolted-on abrasive disks, where the grinding is done on the exposed flat side of the wheel.

The characteristic which makes this class of wheels different from the conventional grinding wheel is the method by which they are mounted on grinding machines. Power is imparted to the grinding wheel through either inserted nuts, inserted washers, projecting studs anchored on one side of the abrasive wheel or a mounting plate of steel or other rigid material cemented on one side of the wheel.

The steel disk wheels (machine face plates) on which these abrasive disks and plate-mounted wheels are mounted must be drilled with holes to match the location and pattern of the holes in the mounting plates or other anchoring devices in the mounting side of the abrasive wheels.

DEFINITIONS

I. Abrasive disks are bonded-abrasive disks which may be of the inserted-nut, inserted-washer, projecting-stud, and tapped-mounting-plate type. On the mounting side of the abrasive disk the inserted nuts, inserted washers, projecting studs, and tapped plate holes are located in a pattern to match the spacing of corresponding holes in the steel disk wheels (machine face plates) of grinding machines.

(a) Inserted-nut disks (Fig 1) have threaded nuts anchored in the mounting side of the wheel and located in a pattern to match the spacing of corresponding holes in the steel disk wheel (machine face plate). Standard diameters, in inches, are:

10	20	36
12	22	40
14	23	42
15	24	48
16	26	53
18	30	72

(b) Inserted-washer disks (Fig 2) have special washers anchored in the mounting side and located in a pattern to match the spacing of corresponding holes in the steel disk wheel (machine face plate). Standard diameters are: 42, 48, 53, 72, and 84 in.

(c) Tapped mounting plate disks (Fig 3) have a tapped mounting plate cemented to the side of disk, the tapped holes

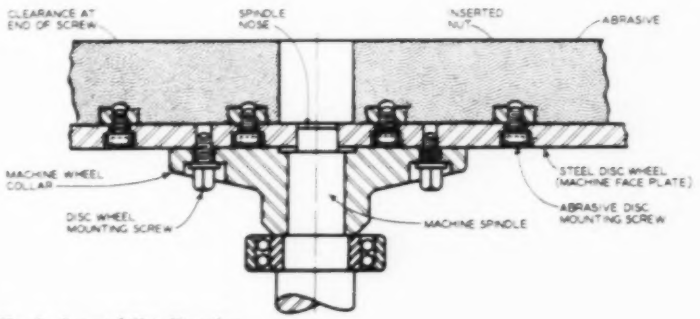


Fig. 1 Inserted Nut Mounting

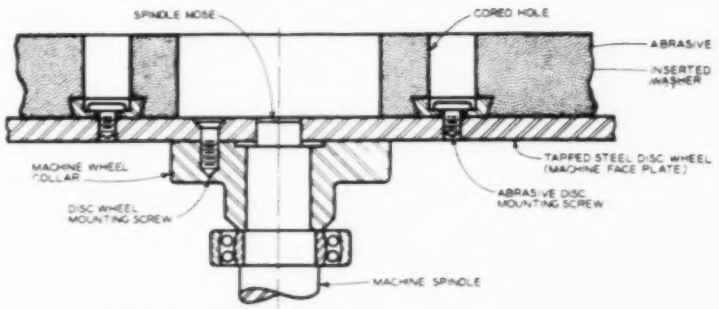


Fig. 2 Inserted Washer Mounting

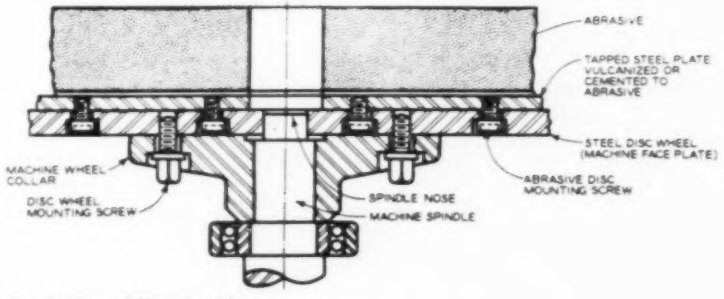
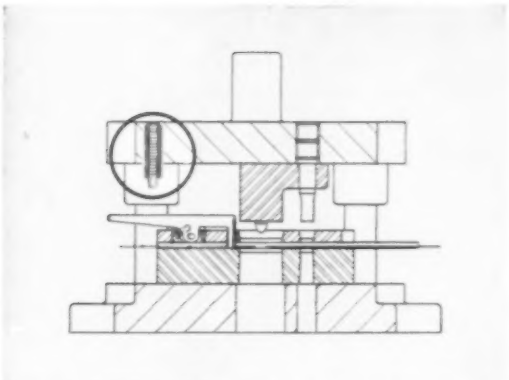


Fig. 3 Tapped Mounting Plate

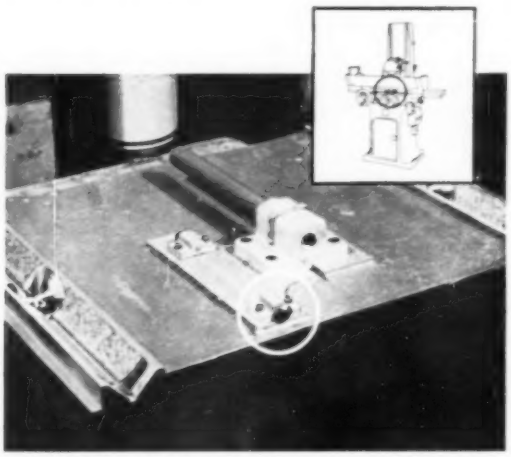
Practical Tooling Tips

Number 2 of a series.

Substituting simple, off-the-shelf Vlier Tooling Accessories for complicated, custom-made devices in both tooling and original equipment applications can result in important savings. Why not put them to work in your plant?



TO STOP SMASHING DIE STOPS, substitute a Vlier Spring Plunger for the usual square-head screw. The plunger actuates the automatic stop perfectly and, unlike the screw, never needs adjusting no matter how many times the die is resharpened. Available in four models: 50 sizes.



TO CUSHION SHOCK as the bed traverses, this surface grinder manufacturer uses two Vlier Spring Stops, reducing wear and tear on the machine. These clever, spring-loaded devices, ordinarily used on fixtures where the absence of side walls prevents the use of spring plungers, are now available in three standard sizes: 3 end pressures. Special sizes made to quantity orders.

TO LEVEL MACHINE TOOLS, electronic racks, benches, etc., use the *standard* Vlier leveling pad. The pad swivels to 7½° each side of the center line; adjusts automatically to uneven surfaces. Unique ball-joint design distributes weight over entire pad surface.

TO GET NEW IDEAS on how to save with Vlier Tooling Accessories, send for new 28-page booklet "Typical Applications of Vlier Tooling Accessories." It suggests dozens of ways to use these time-savers in both tooling and original equipment applications. Write for your copy today.

New catalog now ready! Send for your copy today.

Insist on Vlier Tooling Accessories . . . there's still no substitute for quality!

VLIER ENGINEERING INCORPORATED

8900 Santa Monica Blvd., Los Angeles 46, California

Mountings for Abrasive Disks . . II

being located in a pattern to match the spacing of corresponding holes in the steel disk wheel (machine face plate). Standard diameters, in inches, are:

10	18	26
12	20	30
14	22	36
15	23	
16	24	

(d) Projecting-stud disks (Fig 4) have projecting studs anchored in the mounting side of the disk and located in a pattern to match the spacing of corresponding holes in the steel disk wheel (machine face plate). Standard diameters, in inches, are:

10	20	36
12	22	40
14	23	42
15	24	48
16	26	53
18	30	72

(e) Cylinder-type disks (Fig 5) are similar in shape to Type 2 abrasive wheels, which may be of the inserted-nut type or the tapped mounting plate type. The tapped holes or inserted nuts are located in a pattern to match the spacing of corresponding holes in the adapter. Standard diameters are: 10, 11, 14, 18, and 20 in.

II. Plate-mounted Wheels (Fig 6) are bonded abrasive wheels that have mounting plates of steel or other rigid material permanently attached to one side of the wheel. Mounting holes are located in a pattern to match the spacing of corresponding holes in the steel disk wheels (machine face plates) and are located within the inside diameter of the abrasive section.

For hole spacings in steel-disk wheels, or machine faceplates, see page 143.

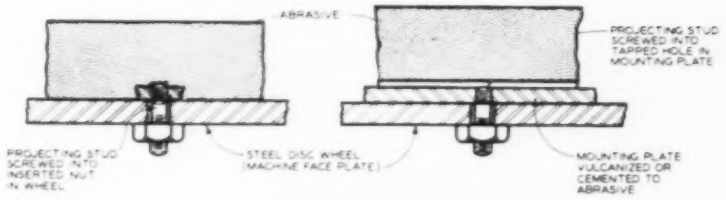

ABRASIVE
PROJECTING STUD SCREWED INTO TAPPED HOLE IN MOUNTING PLATE
PROJECTING STUD SCREWED INTO INSERTED NUT IN WHEEL
STEEL DISC WHEEL (MACHINE FACE PLATE)
MOUNTING PLATE VULCANIZED OR CEMENTED TO ABRASIVE

Fig. 4 Projecting Stud Mountings

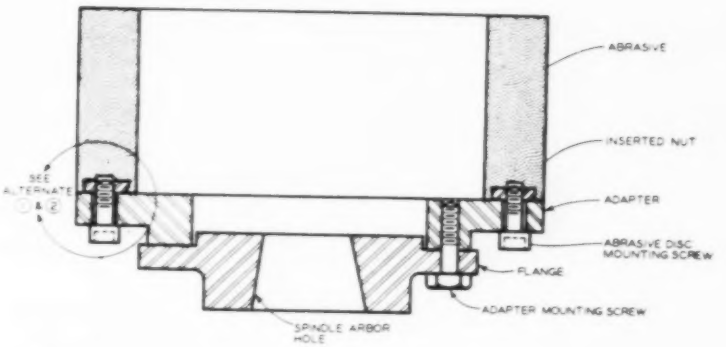


Fig. 5 Cylinder Type Mountings

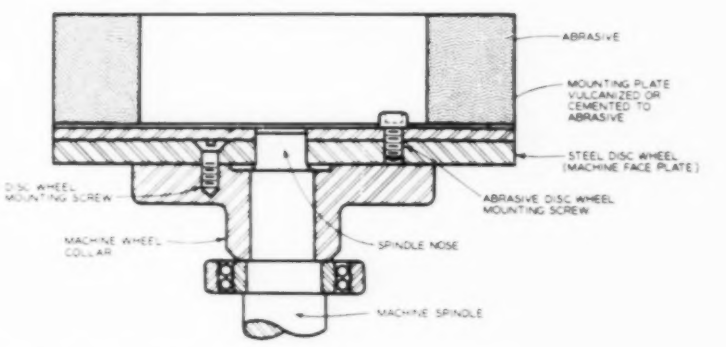
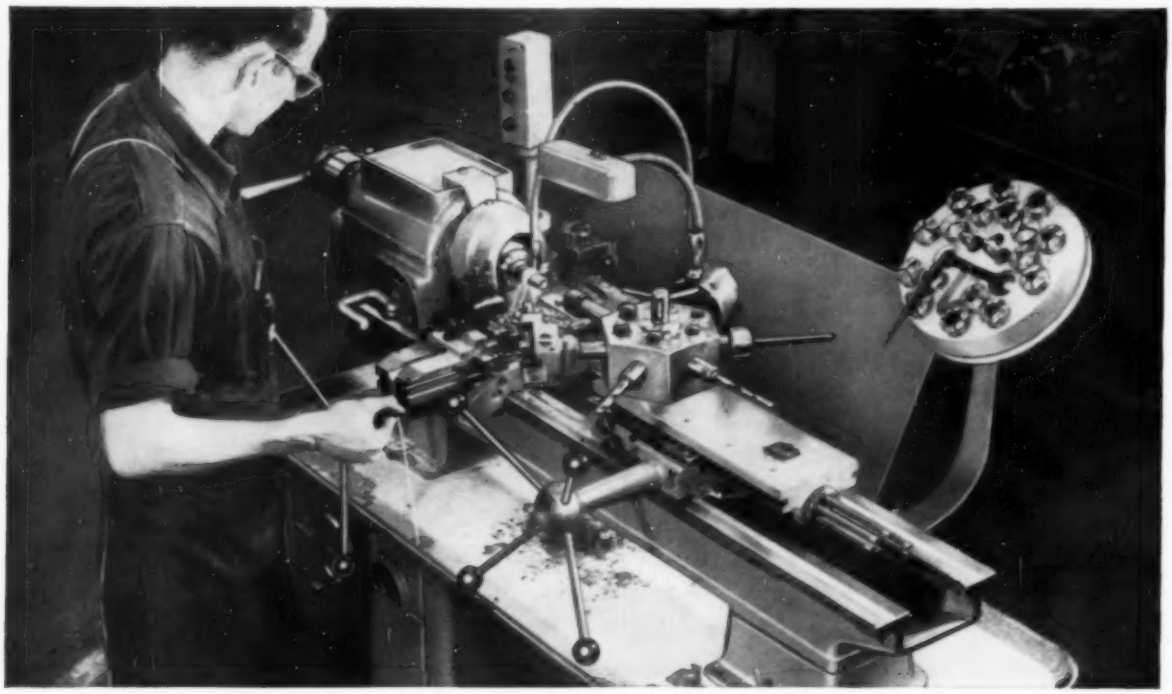


Fig. 6 Plate Type Mounting

American Machinist
REFERENCE BOOK SHEET

ROCKWELL-BUILT

NEW DELTA HAND SCREW MACHINE



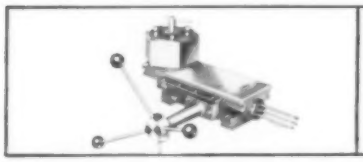
Cuts production costs
on multiple machining jobs

Here is a precision machine engineered to fill the wide gap between standard engine lathes and expensive automatic screw machines . . . and at lower cost than *any* comparable machine!

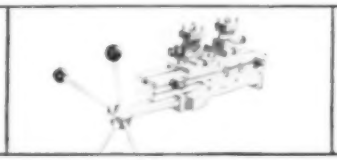
Bed turret, double tool post cross slide and lever type collet closer are included as *standard equipment.* But you don't pay for lathe components you don't use—the carriage, quick change gear box, gear train, gear rack and tail stock.

Delta Quality Features such as perfected Variable Speed Drive and unique Drive Selector offer greater flexibility, assure proper speed and power for each operation. In addition you get the hefty Delta head stock with matched "V" belts in the final drive to the spindle.

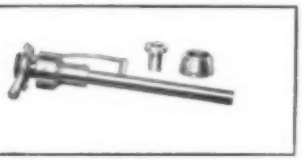
Convert Your Delta 11" Lathe to a Hand Screw Machine by adding the three accessories pictured below and removing the carriage and tail stock assemblies. This gives you the double versatility of a ram-type turret lathe for production operations, and a standard engine lathe for toolroom, maintenance and experimental work.



BED TURRET has a self-indexing, six-station head built for heavy duty. It offers a full 4½" tool clearance over the ram and a 7½" maximum working stroke.



DOUBLE TOOL POST CROSS SLIDE features exclusive, new pilot wheel feed for greater safety, speed and convenience. Provides full 8" travel, extra clearance for tools held in bed turret.



LEVER TYPE COLLET CLOSER takes bar stock up to 1⅛" diameter. Used with all 5-C collets. Bars can be fed, chucked, machined and released without stopping the spindle.

See the Hand Screw Machine at your nearest Delta Dealer . . . he's listed under "TOOLS" in the Yellow Pages.

GET ALL THE FACTS on Delta's new Hand Screw Machine, full line of accessories and the complete line of metalworking lathes. Write for **FREE** Delta Industrial Catalog: Rockwell Manufacturing Co., Delta Power Tool Div., 618A N. Lexington Ave., Pgh. 8, Pa.

DELTA POWER TOOLS

another fine product by

ROCKWELL

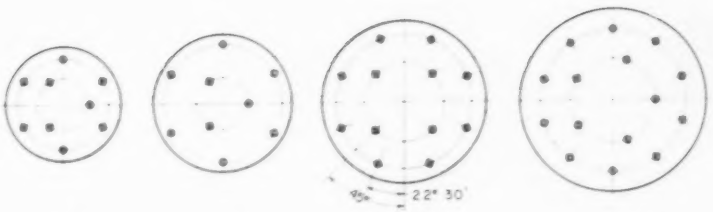
Mountings for Abrasive Disks . . III

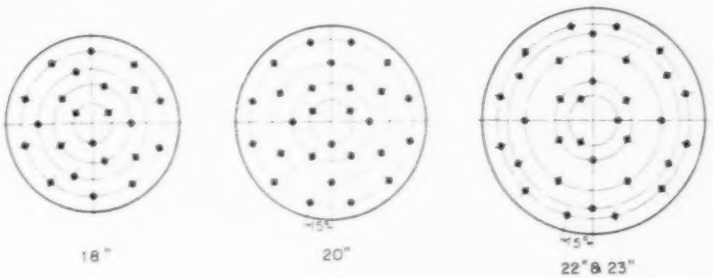
Hole Spacings for Steel Disk Wheels
(13/32-in. holes equally spaced on each bolt circle)

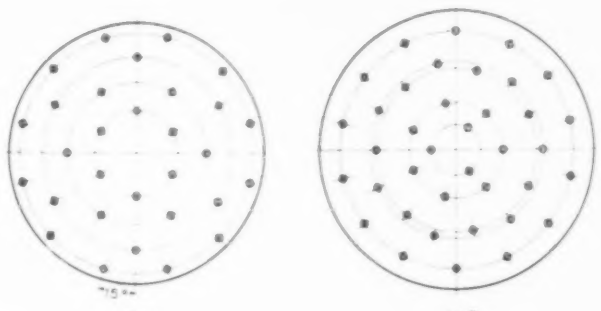
Disk Dia.	No. Holes	Bolt Circle In.
10	3	4½
	6	8
12	3	4¾
	6	10½
14	4	7
	8	12
15 & 16	5	7½
	10	12¾
18	3	4
	5	8
	5	11
	10	12¾
20	3	4¼
	6	8
	6	12
	12	17
22 & 23	3	5¼
	6	8
	6	14
	6	18
	12	20
24	6	8
	6	13
	6	18
	12	22
26	3	4¼
	7	8½
	7	15
	7	16¾
	14	22½
30	3	4¼
	8	11
	12	18
	12	22
	16	26½
36	8	13
	12	20
	16	28
	18	33
Size Below Not Illustrated		
40*	8	13
	12	20
	16	28
	24	36

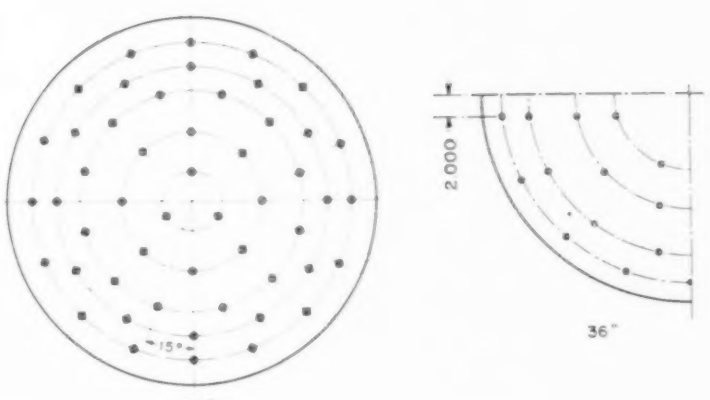
* *Holes on all bolt circles start at 2.000 in. below horizontal centerline in lower left quadrant.*

Abrasive disks in the 42, 48, 54, 72 and 96-in. dia sizes may be drilled 13/32 in. for inserted nut or projecting stud types, or tapped ½-13 UNC-2B for inserted-washer type disks. For hole patterns see American Standard ASA B5.35—1957, published by the American Society of Mechanical Engineers, 29 West 39th St, New York 18.





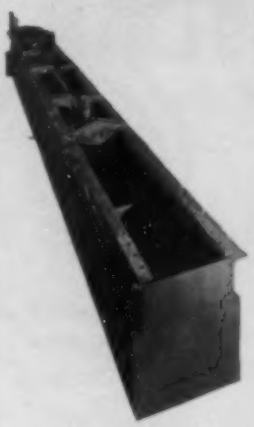




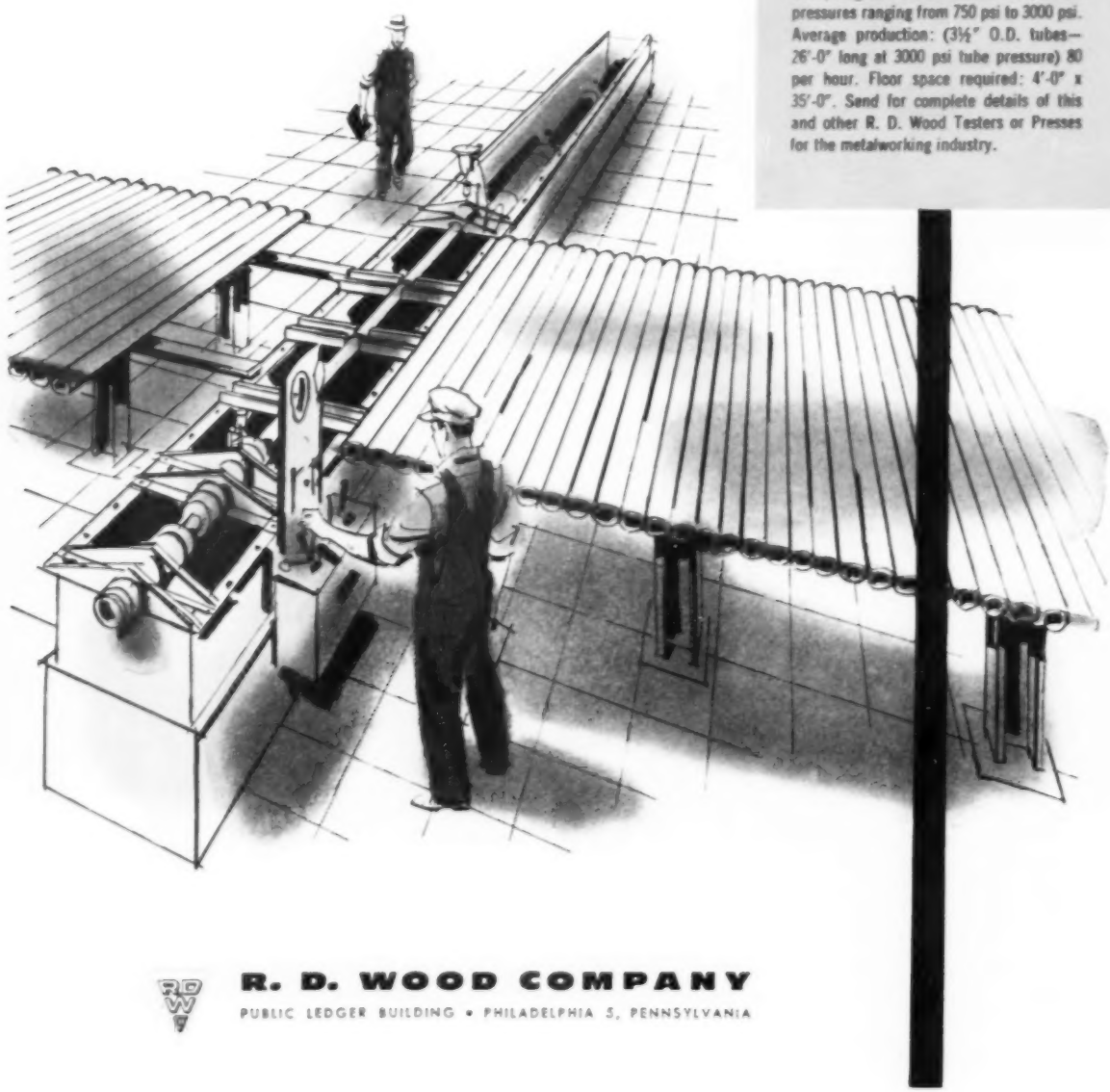
Engineered for Performance

Put a Wood Tube Tester to work and get the money-saving advantages of smooth, dependable performance . . . long operation with low maintenance.

Reason: every Wood Tube Tester is the product of sound design, carefully selected materials, conscientious craftsmanship. This is why Wood Tube Testers and Presses are known throughout industry for their trouble-free operation and fast, economical production. R. D. Wood has many standard tube tester and press designs for a great variety of uses—and engineers others for special work. Write for our catalog and engineering information. No obligation, of course.



R. D. Wood Tube Tester for hydrostatically testing tubes or pipes in sizes from 1" to 4" O.D.; lengths from 10'-0" to 26'-0"; at test pressures ranging from 750 psi to 3000 psi. Average production: (3½" O.D. tubes—26'-0" long at 3000 psi tube pressure) 80 per hour. Floor space required: 4'-0" x 35'-0". Send for complete details of this and other R. D. Wood Testers or Presses for the metalworking industry.



R. D. WOOD COMPANY

PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA

Talking Shop...

Miracle Alloy

IN THE SEARCH for metals to stand the stress and temperature of hypersonic speeds, many exotic new alloys have been investigated. Finally, someone thought to go back and look at the familiar materials. What has to withstand more stress and temperature than the hot-work tool steels (the H class in the SAE-AISI standards). In H-11, the 5% Chrome hot-work steel, a likely candidate has been found and several tool-steel producers are now making this steel in sheet and bar. Naturally H-11 is not a stainless, so would not do for aircraft skin, though it is okay in missile parts. But the labs at Allegheny Ludlum are working on cladding H-11 sheet with stainless to make it suitable for the skin of chemical-fuel aircraft.

New Magnesium Treatment

THE PROMISING ZK60A magnesium alloy got a new boost recently when Dow announced that forgings can gain up to 40% in tensile yield strength when they are solution heat treated for 2 hr at 930 F followed by conventional aging. This T-6 treatment is applied to large forgings where it has been difficult to get the properties possible in small forgings. One wheel forging had a yield strength of 44,000 psi after the T-6 treatment compared with 29,000 psi after the conventional T-5 aging.

Measured Quench

A PORTABLE DEVICE to measure the effectiveness of quenching fluids has been developed by the Process Development Staff at General Motors. The device works on the principle that any metal loses its magnetism at some specific temperature (called the Curie point). For high-purity nickel the Curie point is 670 F. A 1-in. ball of nickel is heated to 1600 F and dropped into a cage suspended in a cup of the quenching medium. When the ball cools to the Curie point it is attracted to a magnet. A timing mechanism gives an accurate report on the time interval between dropping the ball in the cage and the swinging of the cage toward the magnet. Thus a measure of the cooling effectiveness of the fluid is obtained.

Quality Seminar

TYPICAL SCRAP in making carbide is said to be 4%. At Walmet Corp, a new firm in the business, Carl Wiedman was unhappy about this figure. A little one-man investigation showed that it was mostly the human element—cigarette ashes, powder particles left on the press, and walking around with muddy shoes are typical problems. A weekly internal seminar on these problems was instituted to include *everyone* in the plant. Three months of this and scrap is down to 1.5%.

Forged Cast Iron

MAYBE THERE will come a day when the foundries and the forge shops will produce parts jointly. If such a thing comes about, it will likely be the result of new developments in the technology of ductile iron, according to Harry W McQuaid, Consulting Metallurgist.

Speaking at a recent meeting of the Drop Forging Association, McQuaid expressed the opinion that the physical properties of a properly made and treated ductile iron casting could be greatly improved by doing just enough hot working on it to develop a forged structure.

The advantages could work both ways: cast parts could be given the strength and toughness of forgings; and the forge shops could have a source of pre-shaped blanks that would need only one or two blows or pressings in a closed die to make the most accurate finished parts.

Who Is Right?

A NEAT PROBLEM has been passed to us by Frank Zagar. In addition to its regular line of drilling equipment, Zagar has a die-cast drill stand with a felt bottom, designed to hold drills from 1/16 in. through ½ in. For the tap-drill sizes, adjacent holes are provided for taps. The stand is pictured in the literature filled with drills and taps loaded in the conventional manner, shank down.

Two comments have been reported to Mr Zagar by Robert Bayles of the Practical Automation Co: "One man had an enjoyable time ribbing me because the drills do not fit tightly in their recesses. He puts the drills in point down. The second man classes you as a genius because the holes are oversize so the drills fit even after the shanks have been burred in use."

To this Mr Zagar comments that he agrees with the first man because you can avoid cutting yourself putting the drills in the stand upside down, and he agrees with the second man because drills get nicked on the shank as soon as you use them. "Who," asks Mr Zagar, "is right?"

We are also interested in why the holes were made oversize. Two conflicting reasons have been offered. So far, three other possible explanations have occurred to us, but we are restraining our impulse to tell them. What do you think? We'll undertake to procure drill stands for the three readers who offer the best ideas.

"Building Block" Concept—Machine

NEW YORK—The building block concept of machine tool construction, first publicized in this country by Ford in 1956 and more recently presented by Ford at a meeting of government officials at the Pentagon, has generated a sharp division of opinion in the U S machine tool industry, an American Machinist spot check reveals.

Not many machine tool builders are willing to accept this concept without some qualifications. Others express forthright opposition. Meanwhile, Ford, General Motors and Chrysler have organized committees to develop specifications for building block construction, and the Big Three are informally visiting builders to try and sell the idea (*AM*—Dec 16 '57, p121).

In the year-and-a-half since Ford first proposed the building block concept (*AM*—July 16 '56, p113), the opinions of machine tool builders have changed but little if any about it. These current opinions, gathered by wire by American Machinist, are set forth below. Some builders have authorized direct quotation of their views, but others have asked that their identification be withhold.

More Flexibility Needed?

● "I feel that more flexible high-production equipment is needed by the whole metalworking industry to meet the requirements of frequent changes in products. These changes seem to be increasing in frequency as time goes along. In so far as standardization will assist our customers in achieving these changes, the machine tool industry will benefit from an increased volume of business.

"I think standardization, such as uniform distances between stations, will provide machine tools easier to work around and service. In time this will improve quality level of machines to the benefit of the machine tool industry.

"Perhaps it is to the point to cite the JIC electrical standards that now are generally accepted. They have improved the performance of machine tools and are a real credit to the machine tool industry. We at Cross have actively and aggressively standardized in building our own machines. Some other builders have done the same thing. Our customers have encouraged a free exchange of ideas among us and all of us who have participated have benefited from such an exchange.—**Ralph E Cross, executive vice president, The Cross Co.**

"Possible to Work Something Out"

● "Individual manufacturers are already standardizing on their own transfer equipment. Further standardization will mean conferences and agreements between manufacturers of this type of equipment, to see how far it can be carried out without holding back or handicapping development of these companies in designing their equipment.

"Mattison has, by employing standard grinding heads of parallelogram design, been able to arrange the heads in groups or individually, to grind any angle or in any plane. If a workpiece has been discontinued, the heads can be rearranged and used for an entirely different piece of work.

"Many items have been standardized by industry and are working to the advantage of all concerned, for example, motors, motor frames, valves, etc. However, transfer machines are more complex, will require considerable effort by all concerned. It should be possible to work something out without jeopardizing the ingenuity of individual transfer machine builders."—**A C Mattison, president, Mattison Machine Works.**

Offsets R&D Gains?

● "When you begin to standardize the design and manufacture of machine tools, you lose most of the advantages stemming from research and development. The same unfortunate results would come from standardization of any product—TV set, a radio, an automobile. Think of a passenger car with a Chevrolet body, Ford engine and Plymouth transmission. That in effect is what is being proposed by advocates of the building block concept."—**name withheld.**

"You Can't Generalize"

● "I don't believe that you can make any generalized statement that all machine tools should be built in a certain manner. Undoubtedly the building block concept would lend itself very readily to certain types of machine tools. There may be others which, because of the particular function they perform, would not lend themselves to this idea. It seems to me that you have to examine each particular instance before you could say that this concept can be applied."—**William L Dolle, president, The Lodge & Shipley Company.**

"We See No Objection"

● "Customers for our special machine tools are interested in quality, performance, and service. We see no objection to using a customer-designed unit that allows us to maintain our standards of performance."—**D E Hawkinson, vice president, Greenlee Bros and Co.**

"New as Noah's Ark"

● "The building block idea is about as new as Noah's ark. We have been using this method of manufacture in making our own types of machines for many years. But naturally our standard machines are not made to the same dimensions as those of our competitors. They should not be, for such sweeping standardization would be a serious deterrent to new beneficial designs.

"Apparently the general idea behind the building block concept is to get it formalized into a second JIC. That seems to be the intention of the automobile companies. But before that is attempted, some thought should be given to the fact that JIC standards have cost a lot of money to machine tool builders and to their automotive customers."—**name withheld.**

Ultimate Benefits?

● "We at Natco are, and have been, in complete agreement with the basic concept of the building block program. We have always had a preference for bolted joints except in those few exceptional cases where extreme strength and rigidity are required.

"Actually, for over 20 years, we have been building transfer machines embodying most, if not all, of the features classified as 'building-block construction.' Interestingly enough, we have encountered resistance from some of our customers who preferred welded one-piece construction.

"We feel it is premature, at this time, to comment on the proposed uniformity of mounting patterns. Transfer machines are invariably designed around the workpiece. It seems obvious that the height from

Tool Builders Speak Their Minds

the floor to the workpiece must be standardized before the surrounding structures can be standardized. In our opinion the starting point of any standardization program is for our users to agree on a common conveyor and loading height.

"At such time as our users have reached agreement among themselves on the features they would like to standardize, the various machine tool builders will be in a better position to evaluate these recommendations from the standpoint of their impact on the salient features of their own individual designs. We do not subscribe to all of the details as proposed, but do feel that by careful study and close cooperation a great deal can be accomplished which will ultimately benefit both the user and the builder."—**N M Forsythe, VP and general manager, National Automatic Tool Co, Inc.**

Paves Way for Automation

● "Regarding Ford's building block concept, a program of this type can be of long-range benefit both to the customer and the machine tool manufacturer. Such a program will not halt technical progress but could, as a matter of fact, lead the way to automation in industries which feel at this time they cannot afford so-called automation-type machinery because of the high cost of changeover. The program as outlined to us by representatives of the automobile industry fits our own development program."—**name withheld.**

A Service Due Customers?

● "We feel that certain standards of design should be adopted within the machine tool industry to enable user industries, particularly those in which automatic lines are becoming so prevalent and useful, to attach or link by transfer systems the machines of different makers with a minimum of difficulty.

"We feel that in the interest of the economy of the nation this is a service which we owe our customers."—**E R Fellows II, VP and general manager, Fellows Gear Shaper Co.**

Good for Automation

● "We have been working on building block designs for some time, believing this to be the most satisfactory approach to costly automation lines involving frequent tooling changes.

"Application however is by no means the complete solution to all high production problems. Most standard-type machine tool builders are naturally opposed to the program due to heavy investments in existing designs and tooling."—**name withheld.**

Best for Unrotated Pieces

● "Although our company makes only a few machines that could be adapted to this type of construction, I shall give some of my views.

"The Ford concept of using standardized units in its production lines, known as building blocks, is not particularly new. It is my belief that this concept can be used more successfully on pieces that are not rotated during machining, than on those parts that must be rotated to be machined. In other words, the concept is more adaptable to operations such as drilling, milling, reaming, etc. where the part itself is not rotated, but transferred from station to station in the so-called transfer type machine. The difficulties connected with holding, locating, and transferring pieces that are rotated makes this concept much more difficult. Progress is certainly being made but the nature of the turning machines is such that a standardized unit becomes less practical.

"We actually are working on this problem, as are others, but progress has been slower than in other cases."—**George H Johnson, president, Gisholt Machine Co.**

Some Merit—But . . .

● "I have studied the presentation made by representatives of the Ford Motor Company to Defense Department people in the Pentagon. From the viewpoint of a flexible national defense, the plan has some points of merit. However, I find some impractical suggestions in the presentation.

"The machine tool business consists of many small units. Through the years, each company, forced by competition to improve its product, has made available what constitute in the aggregate the best machine tools in the world. Each company believes it has some competitive advantages in one detail or another over another manufacturer. I believe this competition among individual companies is the healthy American way for industry to procure constantly improved machine tools.

"If the automobile industry decides to buy standardized types of machine tools, I believe such specifications are matters to be discussed between individual buyers and machine tool builders. For example, the Ford Motor Co. has been buying according to the 'building block program' for years and has always been able to find suppliers to meet its requirements. Likewise, if our Government decides to buy machine tools based on a similar program, and is willing to pay for the new engineering, patterns, and castings involved, it will unquestionably find a multitude of suppliers.

"From a National Defense viewpoint, the machine tool industry is basic and fundamental to the well being of every citizen. Any program that would tend to reduce the vitality of this essential industry would be a step backward.

"The views I have expressed are largely my own, but do coincide with the thinking of many men in the industry. Obviously, my opinions should in no way be construed as reflecting either an unofficial or official stand of the NMTBA, of which I am president."—**A V Bodine, president, The Bodine Corporation.**

Too Soon to Say?

● "We do not feel the Ford building block concept has developed to the extent that we wish to comment."—**name withheld.**

Stifling to design?

● "Can I as an automobile user interchange a Ford engine in a Chevrolet? Will a Buick wheel fit a Mercury? Will carburetors or air cleaners interchange between a Lincoln and a Cadillac? Not even the wheel treads are the same.

"If all the above were possible, there would be nothing to choose between a Ford and Chevrolet except the gadgets.

"The same is true of the block concept—it will definitely stifle design and ingenuity—force the lowering of prices and profits to the machine tool builder, who even now

NEWS REPORT

BUILDING BLOCK (continued)

does not receive due compensation for the production gains he makes possible.

"Ultimately, there would be only one or possibly two builders of each type of machine tool in existence. Perhaps the final result would be that the automobile builders would decide to build their own machine tools except that they would never be able to produce the tools as cheaply as they now buy them."—**name withheld.**

OK, But Not to Extremes

● "We believe the standardization of tooling and floor heights of machine tools is advisable, but complete building-block standardization can be carried to an extreme which would result in the loss of individual initiative, design and ingenuity. This stifling of originality would be harmful to industry."—**H G Bixby, president and general manager, Ex-Cell-O Corp.**

High Initial Cost

● "Building block construction probably would be economically sound for the user and perhaps for the builder. Initial cost would be high due to engineering, patterns, jigs, fixtures, etc. It seems to us the thing to guard against is the possibility of complete standardization of design which would lead to technological stagnation."—**E R Smith, Jr, executive vice president and general manager, Seneca Falls Machine Co.**

Specials Already Use Concept

● "Most special-machine tool builders like ourselves have for many years utilized building-block principles within their own proprietary design standards. Unification of these individual builder standards is a requirement for user standard systems.

"Recent meetings indicate that the user must be the coordinator. Too much standardization like building-block units can restrict machine efficiency and will increase initial machine costs and floor space requirements."— **H N Maynard, president & treasurer, Snyder Tool & Engineering Co.**

OK If Gradual

● "We took up the building block concept several years ago and have standardized units in a similar manner. Sudden changes would be too costly, but gradual standardization is economically feasible. We favor standardization of only major-unit exterior dimensions, not design or interior construction."—**withheld.**

Not for General-Purpose Units

● "We believe that the building-block concept as advanced by the Ford Company has merit, particularly in the field of transfer machines. We do not believe that this concept is practical in manufacture of general-purpose machine tools.

"Two recent statements should be considered with relation to the building-block proposal. The first relative to standardize production machines, states: 'We realize that the initial investment will be higher for the building-block concept for production machines.' This means that building-block machines cannot be sold in competition with existing designs except at a price disadvantage. This situation would reduce the quantity of machines a particular manufacturer can sell of a particular type.

"The second statement has to do with remarks in 'Studies and Standardization of Machine Tools, Revision MCPB-55-7' having to do with AMC procurement of aircraft-manufacturing equipment: 'The machine shall be designed for incorporation of either tape, punched card, templet, or electrical impulse control by the addition of standard components in the field.' This paragraph really means nothing, except to indicate that there is no selected standard for this type of operation.

"If we examine the real meaning of this paragraph, we see that a new concept in machine control (numerical control) is coming into being, and that the whole design of machine tools will probably change in the next few years due to better control systems, better cutting tools, and this, in turn, will dictate different and better machines.

"The value of general-purpose machine tools to the United States' economy as a whole is never lost because there is always a market for them. The loss to the Defense Department from obsoleted tools is insignificant in comparison with the whole cost of defense. In fact, we believe that the machine tool companies should be encouraged in the development of machines of more advanced design by the continual upgrading of the specifications for more advanced machines by the government, and the purchase of quantities of these machines for use in

Open H & B American's

INDIANAPOLIS — Opening this week is H & B American Machine Co Inc's 112,000-sq-ft aircraft plant, which will build, among other things, precision components for the Convair B-58 Hustler, the Boeing B-52 Strato-Fortress, the Convair Delta Wing F102A All-Weather interceptor, the Chance Vought F8U-1 Navy Crusader, and parts for Douglas, North American Aviation and Republic Aviation. The new plant is equipped with literally hundreds of the newest machine tools, five types of heat treating furnaces, salt baths and quench tanks, Zyglo and Magnaflux inspection systems, and a novel overhead conveyor system. Some 107,000 sq ft of the plant's total space is devoted to the open production of aircraft parts, with flow of materials controlled from a central island. Built to accommodate a prearranged production plan, the plant is expected to cut the cost of aircraft parts production drastically.

Three spindle Hydrotel (10 x 3 ft) machines three wing spars at a time

defense plants to establish new production techniques."—**J. Daugherty, staff vice president-engineering, Giddings & Lewis Machine Tool Co.**

Some Controversial Points

● "A careful study of the Ford proposal brings up several controversial points:

"Machine tools are produced at a low volume, making it impractical to tool for ultimate manufacturing accuracy. The final accuracy in nearly all machine tools is the result of intelligent selection and fitting of the various components.

"In any overall standardization program, improvement of the product will be greatly hampered by the complexity of making any change in design. A change in design will affect every machine tool maker making the components; the drawings, records, parts in process and parts in stock will have to be considered. In addition, all stock parts in customers' hands must be considered, and any error in the process of revision would be reflected on every machine using the component. Design changes would have to be completely ruled out. Therefore, it would appear that all improvements in machine tools would stop.

"Ideally, if all machine tool manufacturers worked with the same drawings and made identical machine tools, maximum interchangeability of components could be realized. If this were the case, all other factors being equal, there would be no need for more than one machine tool manufacturer, as there would be no design or quality advantages.

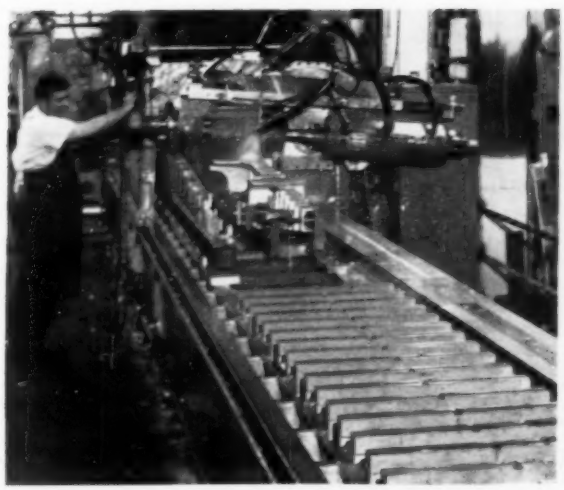
"There would be a considerable loss in economy through an overall building block program, as every component would have to be overdesigned to meet the maximum requirements that it might be called upon to do. This would penalize and increase the cost on all operations requiring less horsepower or rigidity. This plan defeats the advantage that is gained on highly repetitive work for special machine tool use. National emergency requirements are usually highly repetitive and demand is high during this period for single purpose machines rather than high versatile equipment.

"To launch an overall program, of the type programmed by Ford, would entail millions of man hours of preparatory work. During this preparatory period a moratorium would have to be declared on all design changes and machine improvements. These man hours are needed for other things during times of national emergency and the expense of these man hours could not be assumed by private persons.

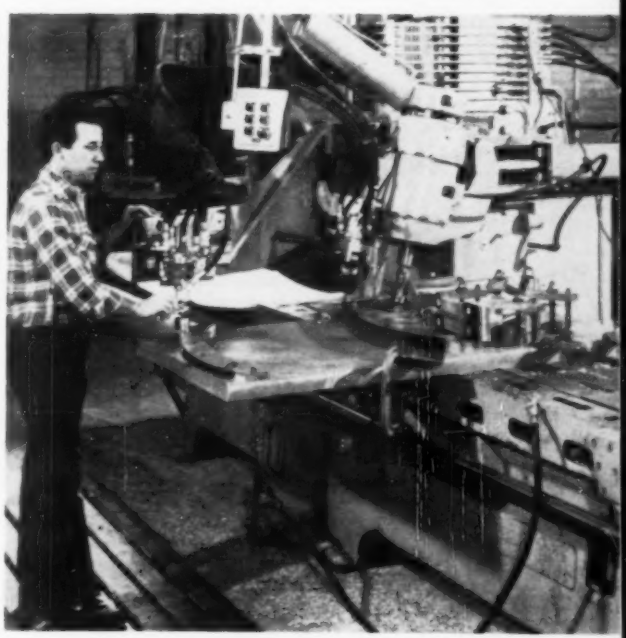
"A modification of the building block principle might be desirable within the structure of a given machine tool builder. A system employing various combinations of standard elements to give greater versatility at lower cost would be advantageous.

"This approach would allow certain economies and a greater range of work covered by a given line of machines. It is highly improbable that the various components could be assembled by a user in a satisfactory way as considerable skill and machine tool knowhow is required for this operation. An overall interchangeability building block program that would embrace all machine tool manufacturers appears to be highly impractical. The approach is an idealistic one but impractical due to the limited consideration of existing machine tool practice."—**Walter K Bailey, president, Warner & Swasey Co.**

112,000 Sq-Ft Aircraft Parts Plant this Week

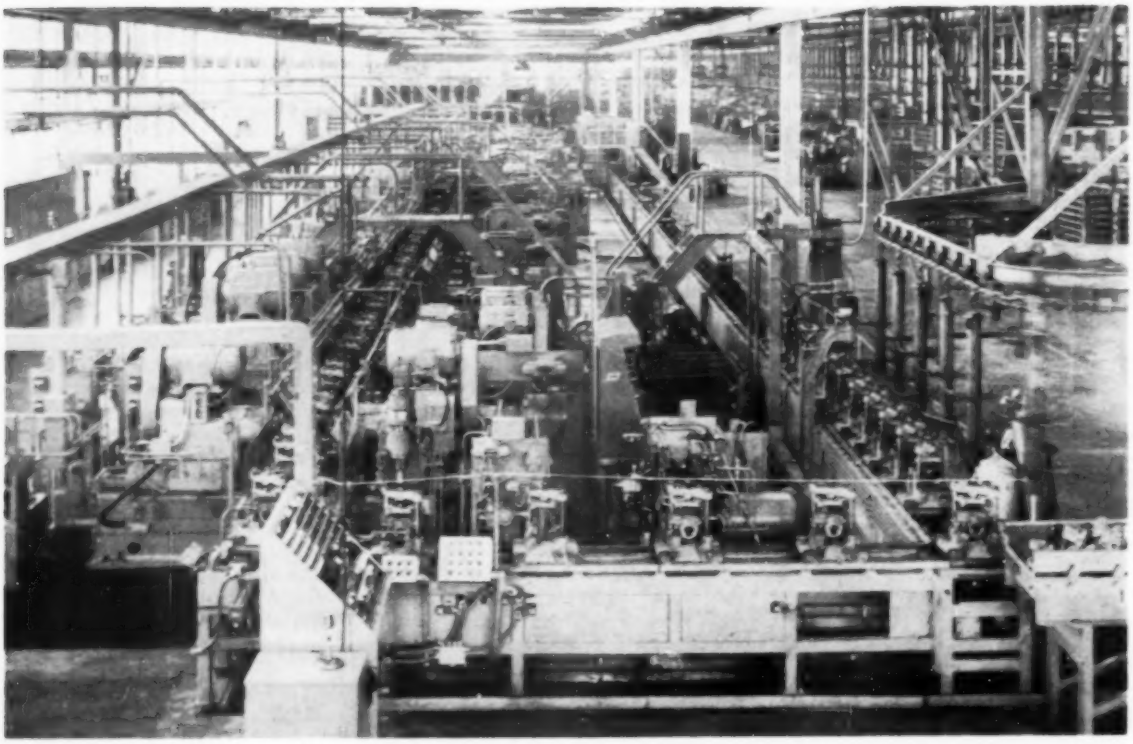


90-ft-long Onsrud spar swarfs (twist mills) the contour on wing spars. Cutter is 8-in. dia by 18-in. long, rotates at 4000 rpm

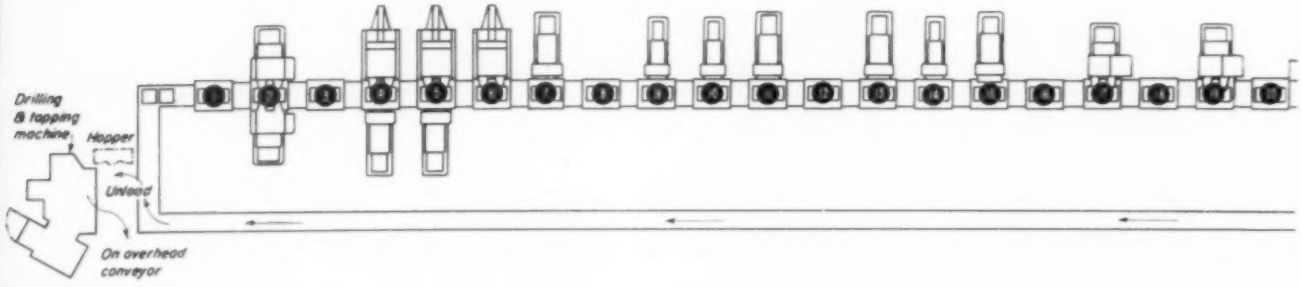


Twist mill designed and built by H & B machines twists the contour on fuselage bulkheads

225-Ft Palletized Transfer Unit



Cast iron is machined wet on this 225-ft Greenlee transfer machine. Safety cord running full length of machine stops all operations in an emergency, and heads withdraw 1/16 in. to prevent tool damage. More than 700 gpm of coolant and a quarter-ton of chips are processed through machine's Hydromation Filter reclaiming unit hourly. Underfloor sluicing trench carries water-soluble coolant to the unit, where coolant is filtered, cleaned and returned to the system, and chips are blown outside directly into railroad cars on adjoining siding



Station 1: idle.
Station 2: (top) 2 spindles mill cover face; (bottom) 2 spindles mill plug face.
Station 3: idle.
Station 4: (top) 2 boring spindles; (bottom) 2 stub spindles.
Station 5: (top) 2 boring spindles; (bottom) 2 combination finish bore and chamfer machines.
Station 6: 2 boring spindles.
Station 7: 2 recessing spindles.
Station 8: manual removal of pallet from side of idle station.
Station 9: 2 drill spindles.
Station 10: 2 drill spindles.
Station 11: 8 drill spindles.
Station 12: manual removal of pallet from side of fixture.
Station 13: 2 drill spindles, chamfer.
Station 14: 2 drill spindles, combination counterbore.
Station 15: 8 tap spindles.
Station 16: part is rotated 90°.
Station 17: 2 spindles rough mill.
Station 18: idle.
Station 19: 2 spindles finish mill.
Station 20: manual removal of pallet from side of fixture.
Station 21: (top) 14 drill spindles; (bottom) 2 stub spindles.

Machines 240 Gear Housings an Hour

SAGINAW, MICH—Power steering gear housings are machined at a rate of about 240 per hour in a 225-ft long Greenlee palletized transfer machine at GM's Saginaw Steering Gear Division here. A total of 128 separate operations are performed on these parts in 37 work stations, using 139 different tools. Said to be the world's largest palletized transfer machine, the unit weighs 550 tons and is equipped with 89 electric motors that produce a total of 642 hp. Controls include 381 limit switches and 506 contactors and relays.

Prime purpose in going to this type of equipment, according to W H Doerfner, general manager, is to improve quality control and uniformity of the product. Moreover, as the machine is built on the principle of building-block construction, wings, bases, and other components can be rearranged in the future.

At the start of the line, an operator removes raw castings from a Simplicity hopper-fed vibratory conveyor and loads them on the pallets. At the completion of each index, or transfer, elevating dowel pins raise and enter bushings in the pallets, after which each one is hydraulically clamped—ready for the machining operation. The transfer mechanism returns to its starting point and the heads advance, perform their operations and then return. The pallets are then released and the locating pins withdrawn.

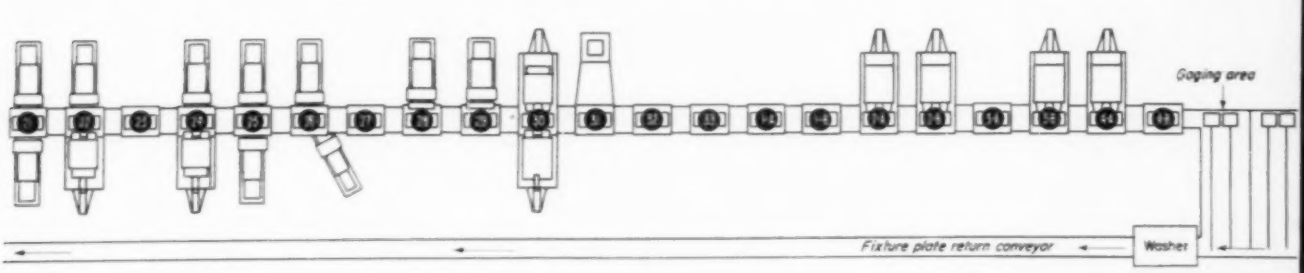
All functions are hydraulically operated and electrically interlocked so that the heads must advance, work, and return, before the pallets can be released and the transfer bar operated. Similarly, the pallets must be transferred to each successive position and be clamped securely before the heads can advance. In the event any function in the sequence fails, the automatic cycle becomes inoperative. A system of lights on the operators' control panel quickly indicates the source of such trouble.

As they are transferred through the machine, housings are drilled, chamfered, tapped, milled, bored, faced, recessed, deburred, cleaned, and inspected. Transfer of the pallets through the first 30 heads (both angular and horizontal), is two at a time. At the end of this section, transfer is four at a time through four horizontal heads where the housings are semi-finish and finish bored. Because these operations take longer than those performed earlier, production is balanced by means of extra heads and doubling the index.

Five manual inspection stations (in addition to automatic probing stations), are provided with means to remove the pallets from the line without interrupting the work flow. At these points, flush-in gages are used to check milled faces and bores in addition to other gages for checking drilled and tapped holes.

An Allied Steel and Conveyor Co (Detroit) system makes up the return route which includes, as the first step, a Peters-Dalton Inc (Detroit) automatic washer. In this unit, the pallets, with housings installed, are tilted and blown off to remove chips in addition to the cleaning operation. The Allied high-speed return chain conveyor carries the pallets and work from the washer to a Buhr 4-station rotary indexing machine at the head of the line where frame pad holes are spotfaced, drilled, reamed, and tapped. Before reaching this point, however, the parts are manually and automatically deburred.

A float for the Buhr setup is provided after these operations by means of a walking-beam transfer section where the pallets index in a regular cycle after being transferred from the chain conveyor. Automatic nut-runners at this section unclamp the pallets to facilitate removal of the work for loading the Buhr machine. After producing the frame pad holes, the work is hung on carriers on an overhead conveyor for transfer to another area.



Station 22: (top) 6 drill spindles; (bottom) 2 boring spindles.
Station 23: idle.
Station 24: (top) 10 drill spindles; (bottom) 2 boring spindles.
Station 25: (top) 2 stub spindles, 2 combination rough bore and chamfer for 1.8745-1.8765-in. dia and chamfer for 1.4995-1.5005-in. dia; (bottom) 2 recessing spindles.
Station 26: (top) 10 drill spindles; (bottom) 2 drill spindles.
Station 27: manual removal of pallet from side of fixture.
Station 28: quick approach—10 spindles, eight ⅜-16 taps and two 5/16-18 taps.
Station 29: quick approach—6 spindles, 5/16-18 taps.
Station 30: (top) 2 spindles finish bore 1.8745-1.8765 dia ∓2; (bottom) 2 boring spindles.
Station 31: automatic removal of (1) pallet from side of idle station.
Station 32: part is rotated 90°, cross-over style.
Station 33: idle.
Stations 1-A and 1-B: automatic shuttle to accumulate 4 pallets.
Station 2-A: 2 boring spindles.
Station 2-B: 2 boring spindles.
Station 3-A: idle.
Station 3-B: 2 boring spindles.
Station 4-A: 2 boring spindles.
Station 4-B: cycle button.

Government Tool Disposal Policies Under Fire

WASHINGTON—The surplus machine tool disposal policies of government agencies—Defense Dept, General Services Administration, and the Office of Defense Mobilization—are now being investigated by the Justice Dept's Anti-Trust Division in an unprecedented move that indicates that the U S government itself is not immune from investigation if its policies violate anti-trust laws.

The Justice Dept is particularly interested in the government's helter-skelter policy of allowing some contractors to use government machine tools rent free on military projects—even to use such equipment on non-defense work without authority. The recent Curtiss-Wright battle with General Services Administration is a case in point.

Now, the Justice Dept, in response to mounting objections from industry, wants to know whether such policies "tend to eliminate competition, create or strengthen monopoly, injure small business, or otherwise promote undue concentration of economic power."

In February, the Attorney General will report his findings to Congress—plus recommendations, if necessary, on how to lessen such effects of machine tool policies.

No Specifics Yet

The anti-trusters will not discuss details about their study; they say it would be "impolitic" for them to disclose such information before their report to Congress. They stress, however, that their outlook "differs from the traditional attitude of Congressional investigations out digging into specific charges."

Their point is this: there have been long-standing gripes about the anti-competitive impact of machine tool policies under the defense program—from military contractors, the Senate Small Business Committee and other Congressional committees, and from within government itself. The anti-trusters claim such charges have not necessarily stimulated the new investigation, that they are required by law to make special studies of the defense program and are just getting around to the machine tool aspect of it.

But other government officials are not so guarded in their comments about the machine tool program's anti-trust implications.

A typical comment from one official: "defense tool and facilities policies have fostered monopoly and reduced competition among contractors. Some are using government tools on military projects without paying rent, others are using such equipment on non-defense work without authority. We should be trying to keep things equitable. The Justice Dept should be sharp enough to see what's going on here."

Specifically, the critics see such anti-trust implications as these:

- The lack of uniformity in tool leasing policies up to now. Military agencies have allowed tool rentals under a wide range of contracts with different types of provisions on terms, purchase options, installation charges, maintenance, and the like. Because of variations in the leasing arrangements, it was possible for one company to have a competitive advantage over another—particularly in instances where major contractors have been allowed a price offset on the end-item rather than a cash rental payment. A recent ODM directive sets up uniform rental rates and leasing rules, which theoretically should correct the situation. But some officials grumble about foot-dragging by the military in putting the new rules into effect.
- Use of government production equipment for non-defense work. There is an over-all ban on such use but the government rules provide for "special circumstances." That is, defense contractors can use military tools in civilian production where the government considers this to be in its own interest—as a means of preserving special tool lines intact and eliminating excessive costs for transporting heavy equipment to storage sites, for instance. Since the ban went into effect four years ago, ODM has approved 103 cases for civilian use of government tools. But officials worry about the number of instances where this is done without the government's knowledge.
- The tendency of major prime contractors to set up new production facilities—with government funds—which are already available and idle in subcontractors' private shops.

South...

Lockheed Aircraft's Marietta, Ga, Div has a new $100 million contract to build a missile-carrying version of its Hercules C-130 combat transport. Order, calling for 53 planes, will carry production into early 1960 . . . **Federal Pacific Electric Co,** Newark, NJ, is building a $500,000 manufacturing facility in Atlanta. It'll fabricate and assemble panelboards, switchboards, motor control centers, and special enclosures. Full operation is scheduled for April . . . **American Engineering Sales Corp,** new Dade County, Fla, R&D firm, has an order from **Fiber Glass Plastic, Inc,** of Miami to design and build a semi-automatic machine for manufacturing plastic panels. Model will be first of its kind in the US to produce corrugated and flat fiber-glass-plastic through a mechanical process . . . **Aerodex, Inc,** Miami aircraft engine overhaul plant, has a new AF overhaul contract for $5 million plus . . . **Southeast Machinery Co,** Fort Lauderdale, will distribute **Thompson** Grinders in Florida; they'll be handled in the North Texas area by **Machine Tool Associates, Inc,** Dallas . . . **Stephens-Adamson Mfg Co** of Aurora, Ill, has its new 40,000-sq-ft facility at Clarksdale, Miss, in full production turning out component parts for conveyor systems made by the company . . . **Link-Belt Co** has opened a new district sales office (its 40th) at 2025 Canal St, New Orleans . . . **Belfab Corp** of Agawam, Mass, producer of precision engineered welded metal bellows, is putting up a new plant at Daytona Beach to serve the Florida rocket and missile industry . . . **Reynolds Aluminum Supply Co,** Atlanta distributor of aluminum products, plans a 70,000-sq-ft warehouse and office building in Louisville, Ky. Facilities will include power shears and slitters to cut metal to customer requirements.

West...

Air Force contract for development of the radical new WS-110A bomber has gone to **North American Aviation.** To be powered by six superjets fed with exotic fuels, bomber will fly at speeds up to 2200 mph across intercontinental ranges at 100,000 ft without refueling. Work is starting

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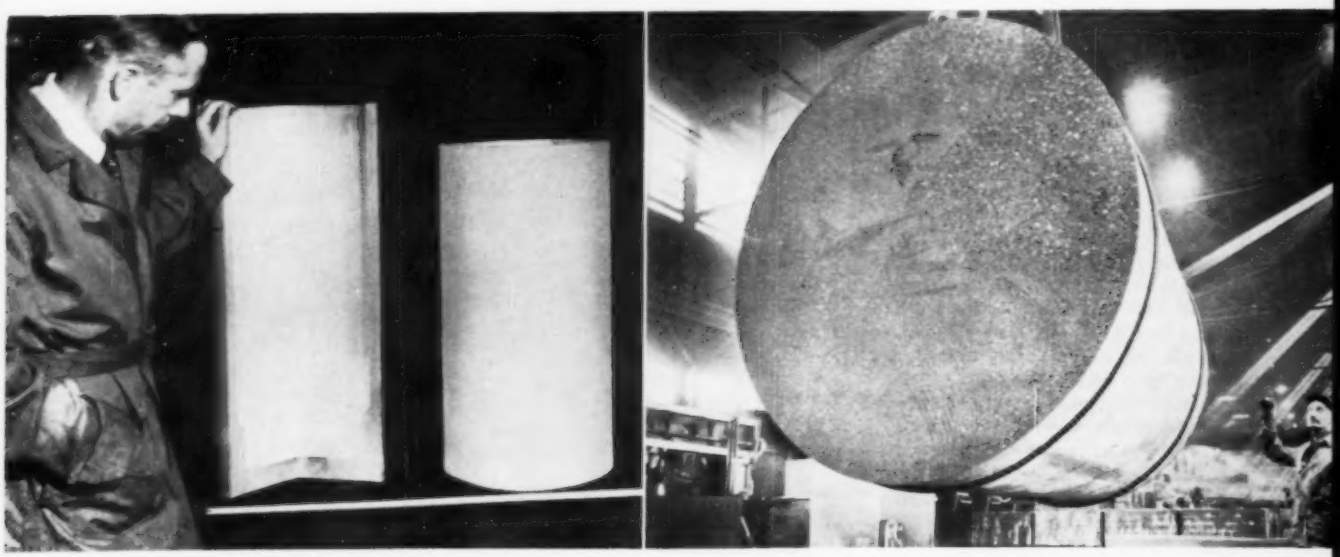
immediately on mockup and prototype stages; it'll probably be at least two years before a flying model is produced . . . **Chance-Vought Aircraft,** San Diego, has a $200 million Navy order to turn out a new version of the Crusader fighter, plus continued output of the older type. New F8U-2 will be powered by **Pratt & Whitney-United Aircraft** J57-T16 engines. It'll top F8U-1 performance which has been clocked at more than 1000 mph . . . Construction has begun on the first building unit of a new research and development center at Newport Beach, Calif, for **Aeronutronic Systems, Inc,** west coast subsidiary of **Ford Motor Co.** Initial units of the multi-million dollar installation are aerothermochemical and materials labs to be used in carrying out experimental work in connection with re-entry aspects of ICBMs currently under development by the Air Force. **Aeronutronic** developed Project Far Side high altitude rocket for the Air Force . . . **Topp Industries, Inc,** Beverly Hills, Calif, through its **Topp Mfg Div,** has gone into the non-military aircraft communications, navigation, and air traffic control fields, already has some $2 million worth of new contracts . . . **United Air Lines,** which has signed a $39.7 million order for 11 **Boeing** Model 720 short-to-medium-range jet transports, will order nine more next year, expects to have 51 by 1965. **United** also may

A new home for the Atlas ICBM . . .
is this new $40 million plant on the outskirts of San Diego, Calif, which will be opened in March by Convair (Astronautics) Division of General Dynamics Corp. Production of Atlas ICBM's will start later in the spring

. . . and a new lab for Titan, Atlas and Thor . . .
Said to be the Western World's only integrated missile facility, this long-secret plant of The Martin Co at Denver is capable of transferring an engineer's line drawing into a complete missile weapon system. Currently undergoing tests at Martin Denver are materials, parts, subassemblies and subsystems for the Titan ICBM. Martin is also working on the Thor and Atlas missiles



A couple of "World's largests" . . .
are said to be Harvey Aluminum's 32-in.-long, 14-in.-dia impact extrusion for a missile body section (left) and (right) National Carbon Co's 10-ton carbon electrode for submerged-arc furnaces

FIELD REPORT

Contour boring a missile nozzle part . . . made from forged AISI 4145 heat-treated steel at Diversey Engineering Co, Franklin Park, Ill, involves a wall thickness accuracy of ± 0.002 in. Workpiece is finish-machined complete with carbide tooling on a Monarch heavy-duty lathe equipped with a swiveling air-gage tracer mechanism

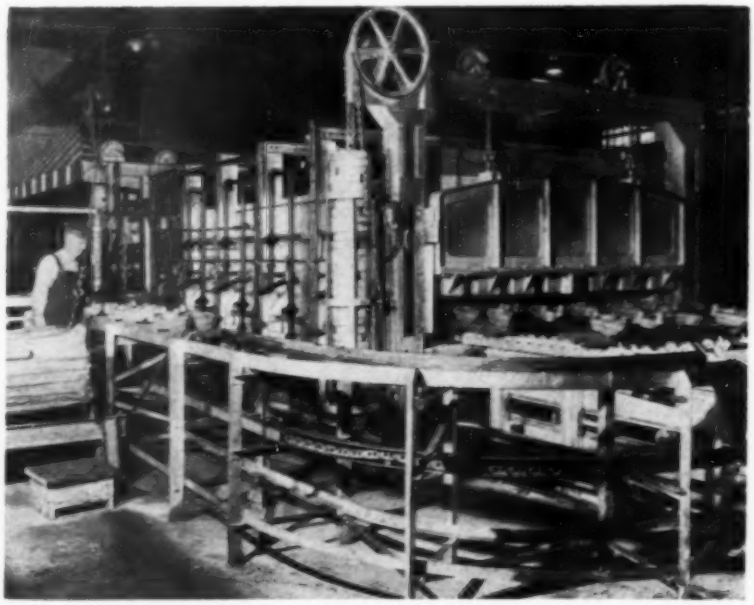
need about 40 additional transports during this same period for short routes; **Boeing** is studying production of such a plane but is waiting for development of suitable engines.

Midwest...

Otis Elevator Co has dissolved its subsidiary (since 1954), the 104-year-old **Baker-Raulang Co**, and formed the **Baker Industrial Truck Div**, Cleveland. **Baker** production facilities for manufacturing gas and electric industrial trucks have been expanded through acquisition by **Otis** of the former **Hupp Corp** plant in Cleveland . . . **Bendix Aviation Corp** has set up a new controls section in Detroit to make and sell tape-controlled production systems. It'll design and build completely automated systems, including associated electronic equipment and drives, to control machine tools in all cutting functions. Automation devices will be available for small tool and die shops with four or five machines, as well as large companies . . . **Ford Motor Co's** 25 millionth V-8 engine came off the assembly line of the Lima, Ohio, plant recently, only slightly more than 25 years after company introduced the first mass-produced V-8 in 1932. The original was a 65-hp job; the current Edsel E-475 packs 345 hp . . . **Republic Industrial Corp**, New York, has sold fixed assets of **Geometric Stamping Co**, a Cleveland subsidiary, for a reported $1.2 million to two Cleveland businessmen.

East...

Brown & Sharpe Manufacturing Co, Providence, RI, has taken over **Double A Products Co**, Manchester, Mich, maker of hydraulic control valves used in building of automated machine tools. Acquisition, which will be operated as a subsidiary, will supplement production of **B & S's** Hydraulic Products Div which makes gear, centrifugal and vane pumps . . . Long-term financing plan for purchase of machine tools has been set up by **New Britain Machine Co** and **C I T Corp**, New York. Terms to 10 years and downpayment requirements as low as 10% are features. Plan, originally developed for customers of the **New Britain-Gridley Machine Div**, will be offered through sales engineers and dealers . . . **Budd Co**, Philadelphia maker of automotive and railroad equipment, has bought approximately 10% of the stock of **Solar Aircraft Co**, San Diego-based producer of aircraft components. **Budd** wants **Solar** to consider merger possibilities, has asked that two of its representatives be placed on the board. So far, **Solar** has no comment, but is on record as being interested in product and market diversification. Both companies have been doing extensive work in advanced metallurgy for aircraft components . . . **Standard Pressed Steel Co**, Jenkintown, Penna, has expanded its **Aircraft Products Div**; it's now the **Aircraft and Missiles Div.** Past and current projects include critical precision mechanical components for the Nike, Honest John, Sparrow, and other military and research missiles . . . **Nuclear Products Div** of **Metals & Controls Corp**, Attleboro, Mass, has been established as a subsidiary corporation under the name **M&C Nuclear, Inc.** Rapidly growing business prompted the move.



Automation for the job forging shop . . . Automation, unusual in forging shops because of their relatively short production runs, has come to the industry in the form of this 95-ft-long, completely automatic heat treating line, designed and built by Surface Combustion Corp. The line can process 3000 net lbs of work per hour, including forgings that weigh from 2.5 to 75 lbs apiece. Automatic tray-return conveyor makes it possible for one man to supervise and operate the complete line

Donald M Patterson (left) has been appointed vice president and general sales manager of the two manufacturing divisions of the Motch & Merryweather Machinery Co, Cleveland. These divisions include the new and expanded facilities at Euclid, Ohio, and the Avey Division at Cincinnati. He formerly was vice president and sales manager of the Avey Drilling Machine Co prior to its merger with Motch & Merryweather. **Warren R Lowe** (center) has been made general manager of the Avey Division in Cincinnati, and **George W Drees** (right) assistant general manager. Mr Lowe previously was secretary of the Avey company and Mr Drees has been works manager since 1947. **Eugene Reutman** will be in charge of sales for the Avey Division. He has been in engineering and sales estimating with Avey since 1949

NAMES IN THE NEWS...

William J Morgan, general manager of the Machine Tool Trades Association, London, is progressing rapidly toward recovery from a heart attack suffered in Italy in October shortly after his attendance at a meeting of the European Committee for Cooperation of the Machine Tool Industries. He was confined at first to a hospital in Italy and later to one in England and more recently has been recuperating in the south of England.

Gerald Carlisle, treasurer of Micromatic Hone Corp, Detroit, has been elected, in addition, secretary of the firm. **Ray W Gauss,** special assistant to the treasurer, has been promoted to assistant treasurer.

E R Danielson has been made assistant to the vice president and general manager of the General Products Division of Allis-Chalmers Manufacturing Co.

C M Rhoten, manager of Ford Motor Co's Des Moines (Iowa) Implement Plant, has been appointed manager of the Highland Park (Mich) Tractor Plant. He succeeds **J M Waggoner,** who has retired. **I H Niffin,** production manager of the Tractor Plant, has been named assistant plant manager; **F A Wagoner,** general superintendent, succeeds him. **W R Phillips,** production manager of the Implement Plant, takes over Mr Rhoten's former duties as manager there.

George S Knopf (left), formerly executive engineer of Bendix Aviation Corp's Research Laboratories, has been appointed manager of a new controls section established by Bendix in Detroit to manufacture tape-controlled production systems. **S H Schuyler** has been named manufacturing manager of the section

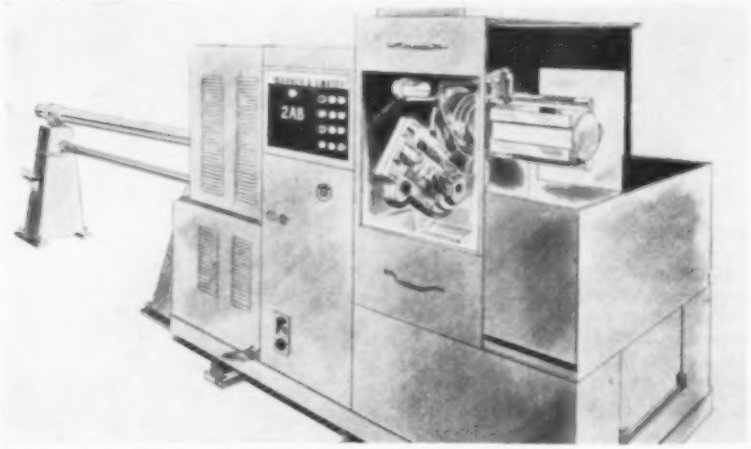
Mark W Cresap, Jr, executive vice president of Westinghouse Electric Corp, has been elected president and chief administrative and operating officer. **Gwilym A Price,** president since 1946, and chairman since 1955, becomes chairman of the board. **E V Huggins,** vice president, corporate affairs, and corporate secretary, has been named chairman of the executive committee of the board, and vice president. **John K Hodnette,** vice president and general manager, has been elected executive vice president.

Walter Kassebohm, executive vice president of Marchant Calculators, Inc, Oakland, Calif, has been appointed general manager. He succeeds **Edgar B Jessup** who has retired as president and general manager and is now serving as board chairman.

J B Cowen, executive assistant to the vice president, manufacturing, of Aerojet-General Corp, has been appointed manager of manufacturing at the solid rocket plant, Sacramento, Calif. Mr Cowen will continue as director of Polaris facilities.

R E Reimer has been appointed executive vice president of Dresser Industries, Inc, Dallas, Texas. He will continue to serve as treasurer. **John Lawrence,** former president of Joy Manufacturing Co, who recently joined Dresser as a vice president, has also been named an executive vice president. **Thomas L Moody,** director of industrial relations, has been appointed vice president in charge of that field.

NEW SHOP EQUIPMENT



Single-Spindle Bar Automatic Handles Short and Long Run Jobs

Designed for the production of complex, precision bar jobs on a fast, automatic basis, the new 2AB single-spindle bar automatic incorporates many of the features of the company's existing line of automatic chucking machines but is suited for both short and long run operations.

The machine is powered by a 25-hp single speed motor (reversible for threading) and has an automatic hydraulically-operated collet chuck and bar feed of 3-in.-dia capacity. Bar feed stroke is infinitely adjustable from ⅛ to 10 in. A restocking indicator automatically shuts the machine down before the bar runs out, thus preventing cutting tool damage from improperly gripped stock.

During the machining cycle, the 2AB provides automatic selection of spindle speeds, feed changes, cutting stroke length, turret indexing, and both front and rear cross-slide operation. Cutoff is handled by an independently operated cutoff slide driven by the spindle and equipped with separate 0.0015 to 0.020-in. feed selection. Operation of this cutoff slide can be started during any one of the pentagon turret strokes, thus allowing cutoff to progress during other machining operations.

The pentagon turret is located overhead, away from chips, coolant splash, and dirt. Both turret and spindle bearings, which are pressure lubricated, are mounted in the same housing and are subjected to exactly the same temperature effects. This insures precision workpiece tolerances without constant tool adjustment.

Both front and rear slides may be set up to operate individually or together with any turret face, and "normal" as well as "late" functions are available. A late cross-slide operation (while turret dwells) permits machining internal necks, grooves and recesses.

There are no cams to change. Adjustable trips on the control drum select speeds, feeds, and cutting stroke lengths. Simple, easily inserted pins on the separate index drum automatically sequence all machine functions. Permanently mounted cams actuate both turret and cross slides.

A manual high-low selector and six-speed transmission provide two ranges of six speeds; from 120 to 1544 rpm in high, and 56 to 728 rpm in low. A total of six automatic feed changes from a selection of 36 feeds are available during the machining cycle, ranging from 0.0019 to 0.124 ipr.

The bar feed utilizes a swing-out tube for easy loading from the front of the machine. Collet chuck is of the drawback type. Two-speed motors (25/12½ hp) can be supplied for jobs requiring lower threading speeds.

Warner & Swasey Co, 5701 Carnegie Ave, Cleveland 3, Ohio

Reciprocating Tool Grinders Grind Tool and Chipbreaker

Two models have been added to company's line of off-hand tool grinders. Both are of the double-end, reciprocating type. Style 142 is for conventional grinding with vitrified or diamond wheels; Style 264 is equipped with metal-bonded diamond wheels for electrolytic grinding.

Machines are designed to perform two jobs in one—conventional grinding at one end and chipbreaker grinding at the other. A vertically adjustable table, mounted beneath the reciprocating chipbreaker wheel, accommodates an adjustable tool block fixture which holds the tool in place while grinding the desired angle on the chipbreaker groove.

Other features include a variable stroke of 0 to 1½ in.; variable reciprocation of 0 to 220 strokes per min; and a built-in, motorized grinding spindle, saddle-mounted to reciprocate along hardened and ground bars. Bulletin 461872.

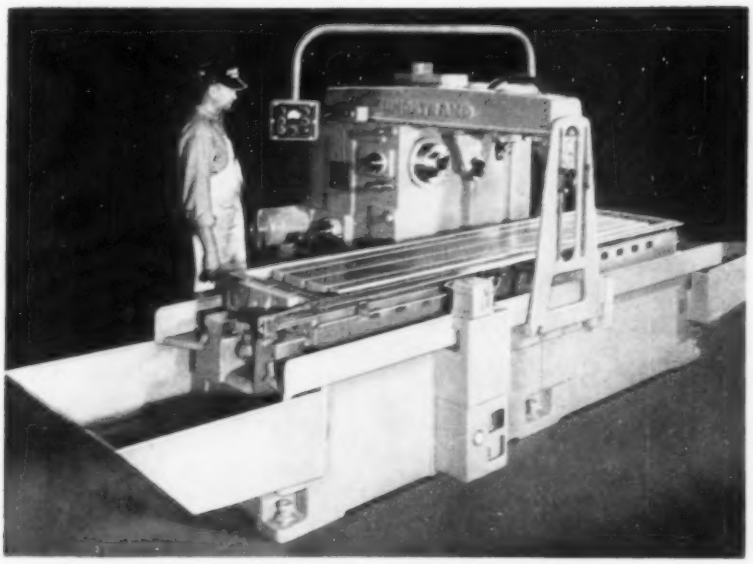
Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich

Coating Protects Pre-Finished Metals During Forming Operation

Mar-Not protective coating protects pre-finished metals during severe drawing and forming operations. It is available in two forms. Type M is a pressure-sensitive paper; type C is a stripping-type plastic film which stretches as the metal is formed. Mar-Not M is easily peeled off. Type C can be peeled off or blown off with compressed air.

American Nickeloid Co, Peru, Ill

MATERIALS AND PARTS



Sundstrand Milling Machine Line Offers Simplex and Duplex Designs

Sundstrand "C" Model Rigidmil line, in both simplex and duplex designs, is reported to offer an unprecedented degree of flexibility of machine selection because unit construction of head, table, and column permits these basic elements to be interchanged through several machine sizes. Machines can be customized to provide the proper combination of table size, stroke, spindle speeds, and horsepower.

These milling machines are available with spindle motors ranging from 7½ to 75 hp, table widths from 14 to 38 in., and table strokes from 3 to 14 ft. In addition, the machines provide both pushbutton control for small-lot milling and automatic control by dogs on the front of the machine for a wide variety of table cycles for production milling.

Mechanical drive to table feed screw has a 100 to 1 ratio between high and low feed rates. Standard feed range is from ¾ to 75 ipm, with 1½ to 150 ipm available as optional extra. Three spindle speed ranges are available in each model except in machines rated from 60 to 75 hp where a high speed range normally is not required.

Two types of factory-installed tracers can be provided. Hydraulic tracing heads are available for work on nonferrous metals and an electronic tracing head for tracer milling in steel. The hydraulic tracer may be disconnected and the machine used conventionally for face or arbor milling. Climb or conventional milling can be performed separately or in combination. Backlash eliminator on table screw provides positive feed necessary for climb milling.

A cast iron box-type overarm provides the rigidity required for all cuts within the capacity of any machine in the line. Other features include screw feed to table; square-type ways; automatic lubrication of all moving parts; unusually heavy spindle with precision bearings; and easy chip removal from chip pans at both ends of machine. Optional features (at extra cost) include horsepower indicator; adjustable dwell mechanism at one or both ends of table; second rate of feed for one or both ends of table; vertical feed and rapid traverse for head; and chip paddles or automatic chip conveyors for removal of chips to chip pans.

Sundstrand Machine Tool Co, Rockford, Ill

including . . .

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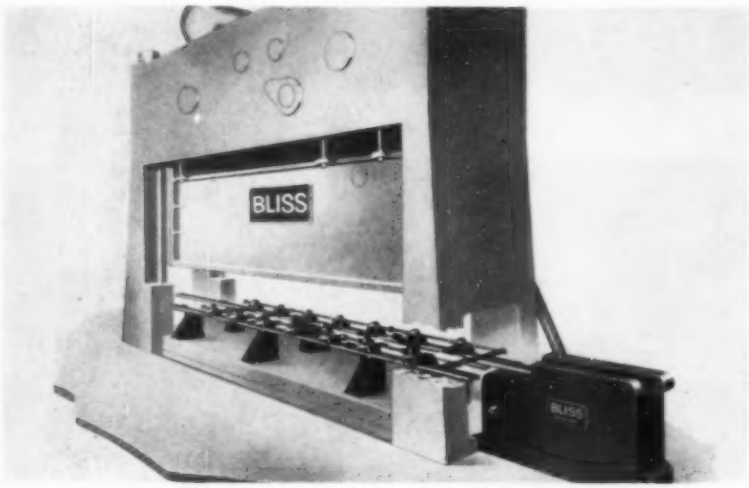


Portable Transfer Feed Unit Speeds Operation of Straight Side Presses

Most straight side presses can be converted to automatic transfer feed operation by means of this portable unit that can also be used to move material through a series of presses. It is operated through one power take-off from the press crank, or may be independently powered and set up to control press cycle.

In operation, aluminum feed rails are driven from right to left, and may be used to push or pull work through the press. Transfer fingers attached to pivoted arms or rack and pinion fingers on the feed rail are actuated through linkage to same drive source as the rails. Finger motion can be adjusted for straight or lifting operation.

Feed stroke is adjustable from 15 to 30 in. in increments of 1 in., and light feed rails can be removed without disturbing die settings. In case of a misfeed, interlocks in each finger stop the press and feed; additional interlocks prevent rails from moving while fingers are feeding.

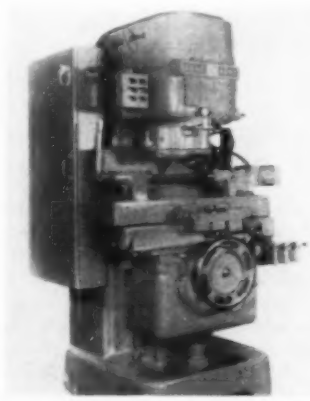
E W Bliss Co, Canton, Ohio

Chromallizing Process Adapted to High Nickel and Colbalt Alloys

The Chromallizing process, which creates on ferrous parts an integral alloy surface rich in chromium and highly resistant to chemical and high temperature corrosion, has been modified to apply to the high nickel and high cobalt alloys used in jet and internal combustion engines and gas turbines. The "SA" Chromalloy process, although differing from the standard treatment (*AM*—Nov 18 '57, p162), is also a metal diffusion process.

Process produces only minor dimensional changes in the part, creates surfaces which withstand prolonged exposure to gases at 1800-2000 F. The new process is not applicable to conventional steels—it works only on high nickel and high cobalt alloys such as type 310 stainless, Inconel X, and N-155 gas turbine alloy.

Chromalloy Corp, 450 Tarrytown Rd, White Plains, NY



Gear Honing Machine Provides Two Different Honing Methods

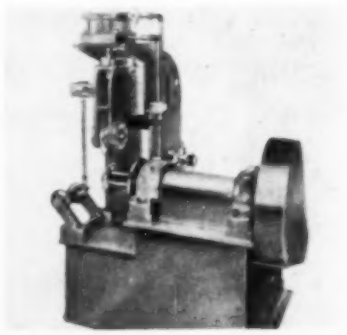
An improved Model GHB Red Ring gear-tooth honing machine provides both constant-pressure and zero-backlash methods for honing hardened gear teeth. The machine has the headstock and air-powered tailstock mounted on a tilting table that is attached to the reciprocating work table through a hinged mechanism at the rear.

For removing nicks and burrs and improving surface finish of hardened gears, a constant-pressure arrangement is provided by the tilting table. A controlled pressure condition is maintained between the work gear and the honing tool by an air cylinder during the honing operation.

When more tooth shape correction is desired, the zero-backlash tilting table arrangement can be used. The work is tilted into tight mesh by an air cylinder and locked in that fixed position by another cylinder. Work is then honed in fixed center-distance relationship with honing tool.

Machine can be equipped for manual, semi-automatic or fully automatic loading. It is made in two sizes—one for gears up to 8-in. pitch dia, and one or gears up to 12-in. pitch dia.

National Broach and Machine Co, 5600 St Jean Ave, Detroit 13, Mich

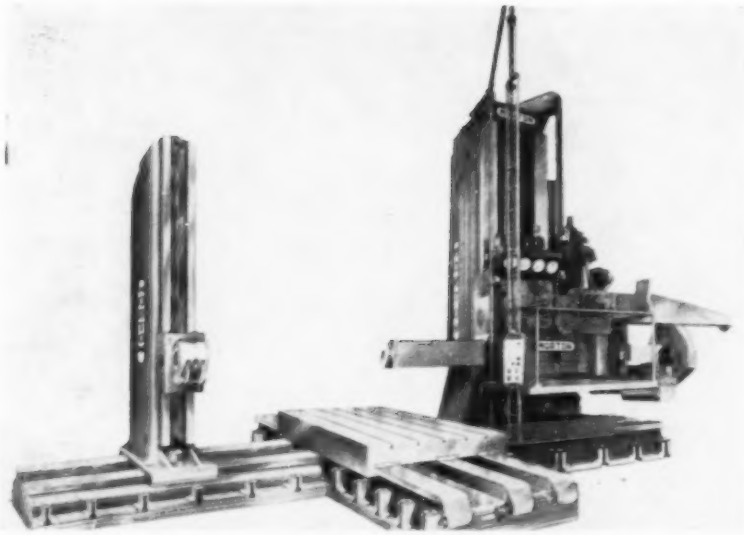


Roto-Tube-Shear Cutoff Machine Has Double Wheel Cutting Action

Unit, employing two opposed, slightly offset wheels for fast cutting through wall thickness of metal tubes, permits proceeding to subsequent fabrications without deburring. Operation is on same principle as a rotary shear, one wheel cutting from inside, the other from the outside.

Capacity is 4½ to 8⅝-in. OD tubing, from light wall up to ¼-in. thickness. When in operation, large support roll permits easy feed to the stop. Powerful 8-in. bore air cylinder starts wheel on its cutting cycle and lowers the support roll, allowing tube to rest on inner cutter. Both roller and cutters return to starting position automatically when operator releases air valve.

Continental Machine Co, 1952 N Maud Ave, Chicago 1½, Ill



Horizontal Boring and Milling Machines Available in Six Models

New series of horizontal boring and milling machines includes both floor-type and planer type machines. The rotating spindle, bearing-mounted in the square ram, moves horizontally with the ram as one unit. According to manufacturer, this design makes the unit at least five times more rigid than conventional round spindle and quill designs.

Included in the line are the Model B and Model BC floor-type machines. Model BC features column cross travel. Likewise the Model P and Model PC planer-type (illustrated) machines are being offered with the Model PC featuring column cross travel. These four models are available in a square ram size range of 9 to 14 in. with an enclosed spindle size range of 6 to 10 in. A smaller series, with an 8-in. square ram and 5-in.-dia. spindle, is offered in the Model LB floor-type and Model LP planer-type machines.

The combination of rotating spindle and square ram, with the ram as a rigid member, allows unlimited accessory applications at extended distance without need for accessory supports. A complete line of quick-change and bolt-on accessories including right angle milling heads, speed-up heads, and right angle slotting heads can be positioned over the full range of the machine. Other accessories such as tapping attachments, boring bars, worktables and floor plates are available.

Morton Mfg Co, Broadway and Hoyt, Muskegon Heights, Mich

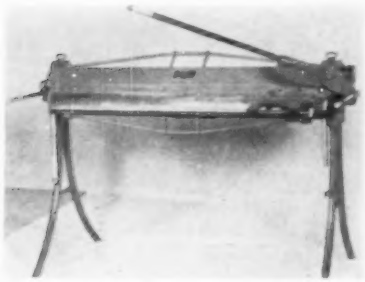
Parts-Handling Unit Air-Cleans, Orients and Elevates Parts

Multi-function parts-handler air-cleans, orients and elevates machined castings such as pump housings. Though designed for custom-tailoring to specific parts, unit is assembled from standard components. The unit illustrated is designed for in-line processing of pump housings and handles 150 8-lb castings an hour through the three steps of the sequence.

Part enters unit through a gravity track to a stop position at the first station. Here, the parts are cleaned by air jets. At the next stop they are oriented before entering elevating shuttle. Parts are then elevated to height of the exit chute and slide down a gravity track to the next operation.

Dimensions, capacity and feed rate are variable to suit the particular application.

Michigan Tool Co, Gear-O-Mation Div, 7173 E McNichols Rd, Detroit 12, Mich

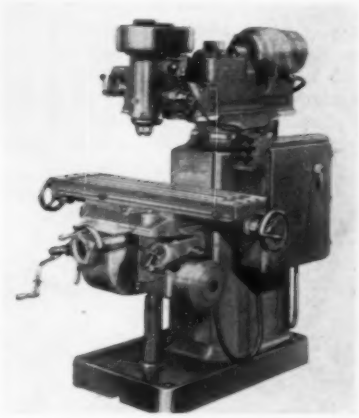


Portable Sheet Metal Brake Forms Sharp Angles, Locks, Seams

Portable and operable by one man, unit forms sharp angles, locks, hooks, heads, boots, seams, and hems. It can be dismantled by simply lifting sections apart.

Brake is available in floor or bench models. Over-all length is 46 to 59 in. for four models. Traveling squaring shear (illustrated), is furnished as extra equipment for quick, accurate shearing operations on the job.

Miller-Knuth Div, Auburn Machine Works, Auburn, Nebr



Geared-in-Head Vertical Miller Has Single-Motion Turret Lock

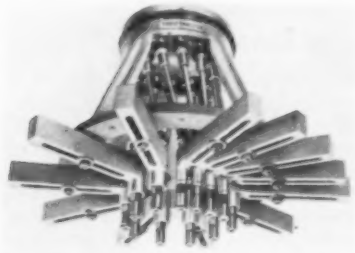
Model 2VG vertical milling machine has the quill capacity to take cutters up to 4 in. in diameter. Quill is driven by a 3-hp motor mounted on the ram. Features of the machine include an automatic collet closer which holds tools up to 1-in.-dia shank size; roller spindle drive, said to eliminate backlash; and a tur-

ret lock which operates with a single motion.

Machine has 12 speeds ranging from 50 to 2500 rpm; six geared changes in ram gear box, high and low range selection on head. The 6-in. travel of the quill can be controlled by hand lever, hand wheel or power feed. Three dial-selected rates are offered—0.001, 0.0025 and 0.006 ipr.

Table has feed rates of ¾, 1⅜, 2⅜, 4 and 7 ipm and a rapid traverse speed of 70 ipm. All controls are grouped for accessibility and ease of operation.

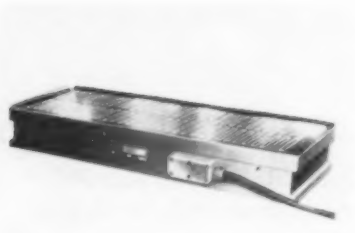
Tree Tool and Die Works, 1600 Junction Ave, Racine, Wis



Universal-Joint-Type Drillheads Available with up to 12 Spindles

Universal-joint-type drillheads are now available in standard sizes up to 12 spindles. Full ball-bearing construction is standard but, for close center distance operations, bronze-bearing mounted spindles can be supplied. The full ball-bearing and bronze-bearing spindles are interchangeable to provide complete flexibility. Unit illustrated has 12 spindles, eight with ball bearings and four with bronze bearings.

Thriftmaster Products Corp, 1016A N Plum St, Lancaster, Penna



Fine-Grid Magnetic Chuck Holds Even Small Parts in Place

New fine-grid magnetic chuck has precision meshed magnetic poles which are reported to be 37% closer together than in other chucks of this type. The resulting powerful magnetic pull holds even small parts in place during machining operations. The poles are ⅜-in. steel separated by ⅛-in. non-magnetic separators of CRP242 hard epoxy resin or Magna-Lock special soft metal. Epoxy resin separators are easy to grind in and are particularly suited for electrolytic grinding because they resist electrolytic action. Company's Magna-Lock soft metal is available as an alternate material.

Chucks consume little power. They are available in all sizes and can be installed in tandem or end-to-end to make up larger machine table surfaces.

Hanchett Magna-Lock Corp, 556 Maple St, Big Rapids, Mich

Square Gage Blocks Available In Chrome Carbide and Steel

Designed for complete interchangeability with all other square gage blocks, these new blocks are 0.900 in. square with a ¼-in. (approx) hole for tie rods. They are available in chrome carbide or in standard steel in a complete range of sizes. Blocks can be purchased as individual or replacement blocks or in sets of 34, 36, 81, 84, 85 and 88 blocks. Accuracies are standard A or B.

Square chrome carbide wear blocks in 0.050 and 0.100-in. sizes, and all standard accessories including tie rods, half-round jaws, scriber points and triangular base blocks are also furnished.

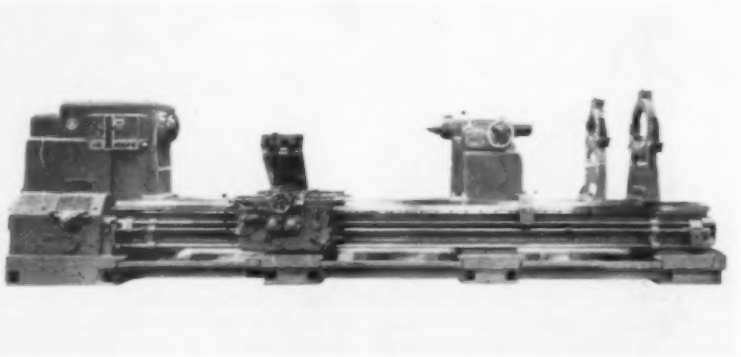
Webber Gage Co, 12912 Triskett Rd, Cleveland 11, Ohio

Addition of Copper to Steel Improves Machinability

The addition of copper to company's Stressproof steel bars has resulted in a 10% (approx) increase in machinability compared with regular Stressproof. Tests have shown that the new product is substantially better than 4140 HT and that it approaches MXB1112, a free machining steel, in machinability. Tool life during machining operations is reported to be improved by 25 to 150% when compared with the regular Stressproof.

Other improvements noted include increased wear and corrosion resistance. Material will continue to have a guaranteed minimum yield strength of 100,000 psi in sizes through 2 in. and 90,000 psi in sizes over 2 in. through 3⅜ in. Other mechanical properties are not guaranteed, although these properties are reported to be enhanced by the addition of copper to the material.

La Salle Steel Co, P O Box 6800-A, Chicago 80, Ill



LATHE, Model 6049F, designed for turning large diameters and odd-shaped workpieces, swings 60 in. over the ways and 49 in. over the cross-slide. Headstock is driven by 40-hp motor and has 24 spindle speeds from 6 to 750 rpm, with 3 to 375 rpm alternate, forward or reverse. Gearbox provides 81 feeds and 45 leads—*Axelson Mfg Co, PO Box 58335, Vernon Station, Los Angeles 58, Calif*

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MACHINES AND ATTACHMENTS

1 RADIAL DRILLS—*West Industries, 24758 Groesbeck Highway, East Detroit, Mich.* Illustrated brochure describes advantages and features of precision unit available in four models with clearances under spindle of 36 or 42 in., and a double-end unit with 42 and 36 in.; drilling capacity (mild steel) 1¼ and 1½ in.

2 INTERNAL GEAR SHAVING MACHINE—*National Broach & Machine Co, 5600 St Jean, Detroit 13, Mich.* 6-page bulletin gives data on Red Ring Model GCE-12-in. for shaving spur or helical internals 3 to 12-in. PD, up to 4 DP with face widths to 2½ in. Design features illustrated; operational details discussed.

3 TOOL GRINDER—*Wesson Co, 1830 Woodward Heights Blvd, Ferndale 20, Mich.* 6-page bulletin PG-257 describes advantages gained from oscillating principle on the 56-B grinder. Explains how tool grinding departments can increase diamond wheel life from 20 to 30%, and get from 30 to 40% more tool grinds per hr.

4 HYDRAULIC KNIFE AND FACE GRINDERS—*United Engineering & Foundry Co, Wilmington Plant, Wilmington 99, Del.* 4-page bulletin describes Bridgeport line available in three models: heavy-duty horizontal spindle, vertical spindle, medium-weight hydraulic-horizontal spindle grinder. Features and specifications covered.

5 METAL PROCESSING MACHINERY—*Stanat Manufacturing Co, 600 Shames Drive, Westbury, NY.* 16-page brochure 1057 illustrates and describes rolling mills, gang slitters, wire flattening lines, roller levelers, and related equipment. Applications, field installations pictured.

TOOLS AND ACCESSORIES

6 COATED ABRASIVES—*Clover Mfg Co, 885 Main St, Norwalk, Conn.* 36-page handbook covers range of information on technical and trade-name data useful in selecting and purchasing abrasive belts, disks, rolls, sheets, etc. Includes sections on storage, and specific ordering pointers.

7 ELECTRO-MECHANICAL CONTROLS—*Tipptronic, Inc, Chagrin Falls, Ohio.* 4-page bulletin AC-3 and 2-page bulletin AC-4 describe 11 recently developed devices including punchpress overload controls; phase fault finders; peak demand limiters; automatic temp controls; multi-point temp scanners; mill motor load controls; machine overload controls.

8 PNEUMATIC TOOLS—*Dooley Tool Corp, Sherwood, Ohio.* Illustrated bulletin 101 gives specifications and descriptive data on Dotco line of rotary vane-type air-driven hand tools for contour finishing and grinding of dies; for finishing molds, patterns, forgings, and castings; and for deburring machined parts.

● PRECISION MEASURING AND INSPECTION—*Opto-Metric Tools, Inc, 147 Varick St, New York 13, NY.* Booklet discusses fundamentals and essentials; describes differences between optical and mechanical inspection instruments; aids in selection of proper instrument for specific work. Request direct on company letterhead.

HEAT-TREATING AND WELDING

9 FURNACES—*C I Hayes, Inc, 810 Wellington Ave, Cranston 10, RI.* Bulletin 471 illustrates and describes Type C-8 Series combination hardening and tempering unit with max operating temps of 1850 F and 1200 F respectively. Information also given on Type C-11 Triple Tier tempering furnace with three separate chambers for maintaining different operating conditions. Applications are for tempering or stress relieving carbon, alloy and high-speed steels, and annealing of non-ferrous metals.

10 WELD INSERT—*Arcos Corp, 1500 S 50th St, Philadelphia 43, Penna.* 12-page illustrated booklet (Form 9674) explains how to obtain a sound root pass

Fill in number of each bulletin wanted

Name _____

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FYI
FOR YOUR INFORMATION

weld with aid of a consumable insert when only one side of the weld is accessible. Fifteen different insert compositions are classified for welding of carbon steels, austenitic stainless steels, non-ferrous alloys, and chrome-moly and chrome steels. Root pass welding procedures detailed; chart lists recommended filler rods.

PLANT SERVICE EQUIPMENT

11 INDUSTRIAL HEATERS—*American Air Filter Co, Dept PD, 215 Central Ave, Louisville 8, Ky.* 24-page bulletin 750A illustrates and describes construction, application, performance features of the Herman Nelson heating and ventilating unit for make-up air or for plant heat load. Performance graphs and charts; dimension diagrams and tables included for all models and arrangements.

12 BRUSHES—*Osborn Manufacturing Co, 5401 Hamilton Ave, Cleveland 14, Ohio.* 8-page bulletin presents illustrated information on Sitsaft and Helituf brushes for cleaning, finishing, and deburring. Characteristics, specifications, applications for each are covered.

13 OVERHEAD CONVEYORS—*Rapistan-Keystone, Inc, 31751 W 8 Mile Rd, Detroit 41, Mich.* "One Volume Library" is folder containing engineering data, field reports on use of overhead trolley systems, product bulletins, material on features, tips on maintenance, charts and diagrams, descriptions of components and accessories.

14 MACHINERY MAINTENANCE — *International Research & Development Corp, PO Box 55, Worthington, Ohio.* 4-page illustrated booklet describes complete line of IRD Systems designed to reduce costs on machinery maintenance and quality control. Lists applications; covers operating ranges of each model.

15 HYDRAULIC EQUIPMENT—*American Brake Shoe Co, Denison Engineering Div, 1160 Dublin Rd, Columbus 16, Ohio.* 4-page bulletin 146-E contains brief illustrated descriptions of constant volume and variable volume pumps, pumping units, fluid motors, control valves. Individual bulletin numbers listed for each, providing fuller descriptions.

16 MECHANICAL AND HYDRAULIC HAND LIFT TRUCKS—*Association of Lift Truck & Portable Elevator Manufacturers, Suite 759, One Gateway Center, Pittsburgh 22, Penna.* 16-page brochure compiled by the Association describes and illustrates skid and pallet types; discusses weight of load in relation to truck size, presents four factors on which load size is determined.

17 TRANSPORTER STACKERS—*Automatic Transportation Co, 149 W 87th St, Chicago 20, Ill.* Three 4-page illustrated brochures cover specifications and features of walkie-stacker electric lift truck models with lifting capacities of 2000 lb (WST-20); 2500 lb (WST-25); and 3000 lb (WST-30).

18 ELECTRIC HEATING UNITS — *Westinghouse Electric Corp, PO Box 2099, Pittsburgh 30, Penna.* 24-page illustrated catalog 27-620 covers strip, oven, immersion, bolt heaters, industrial hot plates. Heater selection guide discusses problems and solutions. Complete line of compatible control equipment covered.

● SAFETY APPAREL—*Advance Glove Manufacturing Co, 901 W Lafayette Blvd, Detroit 26, Mich.* 19-page catalog illustrates and describes complete line of gloves and clothing from seamless finger guards to rubber boots. Charts and tabular data aid in selection and applications; prices, specifications, ordering instructions included. Request direct on company letterhead.

PARTS AND MATERIALS

19 "FATIGUE-PROOF" STEEL BARS —*La Salle Steel Co, 1450 150th St, Hammond, Ind.* 24-page engineering booklet contains complete description of free-machining, high-strength material that requires no heat treating to achieve high strength levels. Bar has guaranteed minimum tensile strength of 140,000 psi, minimum hardness of R_c 30. Booklet reports on use of the material in eight application case studies, provides all necessary engineering specifications of the basic bar and the ground-and-polished product.

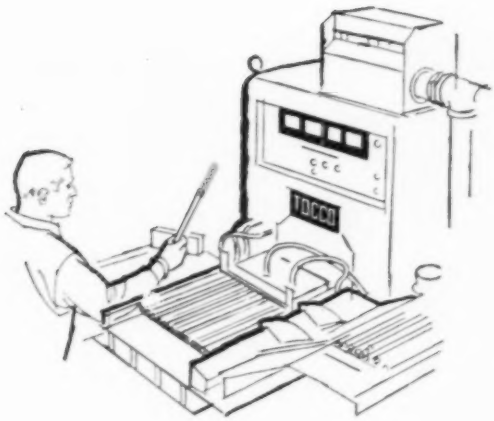
20 ADJUSTABLE SPEED DRIVE — —*The Louis Allis Co, 427 E Stewart St, Milwaukee 1, Wis.* 12-page bulletin 2006 contains data on the Select-A-Speed, available from 5 to 200 hp, a variable-voltage dc drive that uses ac as its power source. Applications discussed and illustrated.

21 FASTENERS — *Simmons Fastener Corp, North Broadway, Albany 1, NY.* 8-page illustrated catalog presents engineering data, dimensional drawings, specifications, and feature descriptions of special fasteners including the Link-Lock, Hinge-Lock, Spring-Lock, Quick-Lock, Roto-Lock, and Dual-Lock.

22 SPIRAL-WOUND METAL GASKETS—*Garlock Packing Co, 415 Main St, Palmyra, NY.* 12-page bulletin AD-104 covers Guardian line. Describes features and design factors, types available for specific applications; charts for suggested sizes in relation to pressures sealed included.

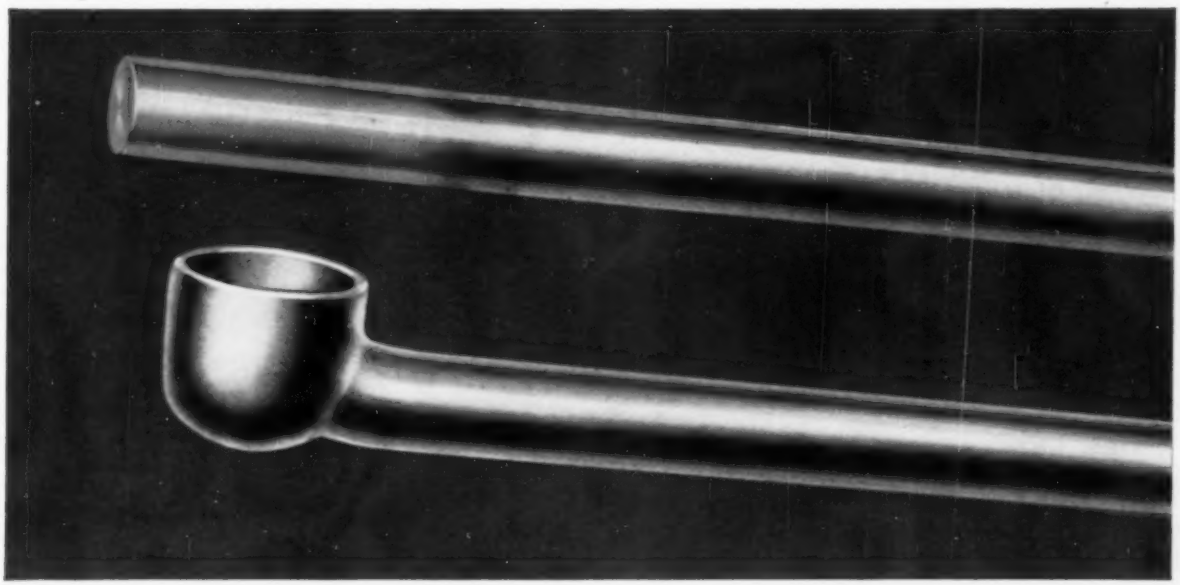
23 MECHANICAL SHAFT SEALS — *Muskegon Piston Ring Co, Rotary Seal Div, Sparta, Mich.* 12-page brochure explains principles of mechanical shaft sealing; describes and illustrates functions and applications, basic component parts, variations possible for solving different sealing problems.

24 FASTENERS—*Huck Manufacturing Co, 2480 Bellevue Ave, Detroit 7, Mich.* 16-page illustrated catalog (Form 8-411) describes line of AL Aircraft Huckbolt fasteners and ALS Aircraft Huckbolt stumps. Driving cycles of the two types discussed; technical data on material, heat treatment and finish specifications; strength properties; rate of installation; dimensional information provided.



Heating Costs Cut In Half

with TOCCO* *Induction Heating*



Engineers at Thompson Products Inc.'s Michigan Division recently changed from gas-fired furnaces to fully automatic TOCCO. Application: heating for forging of automotive tie rods. Result: a substantial reduction in direct labor costs, saving thousands of dollars a year on this heating for forging operation. *Annual savings actually amortize the cost of the TOCCO installation in about one year.*

The automotive tie rod shown here is only one of over 500 parts heated for forging in Thompson's new, modern forge plant. *Every one of these parts is heated with TOCCO equipment.*

If *your* manufacturing operations require heating for forging, heat treating, brazing, soldering or melting, it will pay you to investigate TOCCO as a sound method of increasing production and lowering costs.

THE OHIO CRANKSHAFT COMPANY

Mail Coupon Today— NEW FREE Bulletin

The Ohio Crankshaft Co. • Dept. B-1, Cleveland 5, Ohio

Please send copy of "Typical Results of TOCCO Induction Heating for Forging and Forming".

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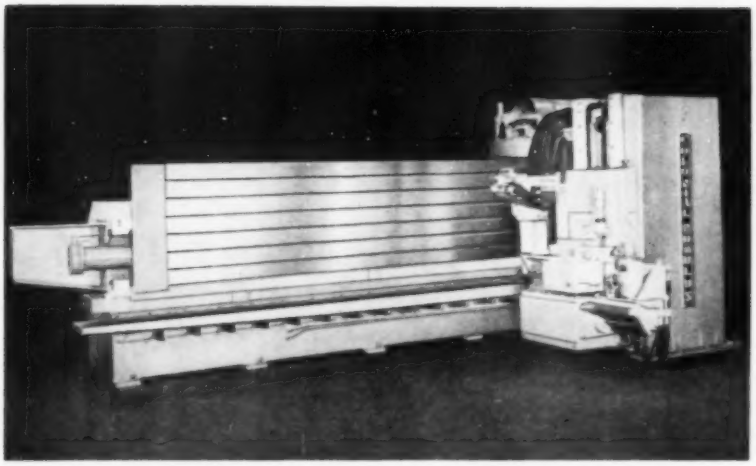


Sculpture Machines Permit 3-D Duplicating at Top Speeds and Feeds

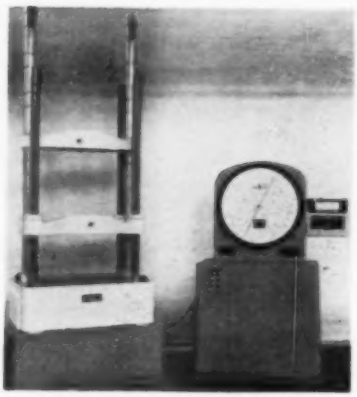
Hydraulically driven sculpture machines for easier and faster tracer-controlled contour and profile milling are available in two sizes—a 120-in.-stroke model and a 144-in.-stroke model. Both have a cross travel of 24 in. A variable speed hydraulic motor drive provides infinitely adjustable spindle speeds from 36 to 1900 rpm. The spindle can be moved in-and-out at rates from 0.5 to 40 ipm and up-and-down at rates from 0.5 to 40 ipm. Horizontal movement of the work and templet is infinitely adjustable over the same range.

Tracer controls are available in several combinations—three dimensional; 360° with adjustable depth control; and tracer-controlled with longitudinal power feed.

Cutter, stylus, controls and adjustments are positioned for easy operator use and visibility. Both the work and templet mounting are on the vertical face of the ram. The machines will work a wide range of metals, including the latest high-temperature, high-strength alloys, with consistent accuracy. Suitable for applications from rough cutting to finish machining, the machines permit true 3-D duplicating at maximum speeds and feeds for the material being machined. Jobs as long as an aircraft wing spar or as compact as small forming dies can be handled. Small-size work can be machined side by side.

Special sizes and capacities can also be supplied. Depth control is optional equipment on all models in this line.

Colonial Broach and Machine Co, Colonial-Romulus Div, Parkgrove Station, Detroit 5, Mich

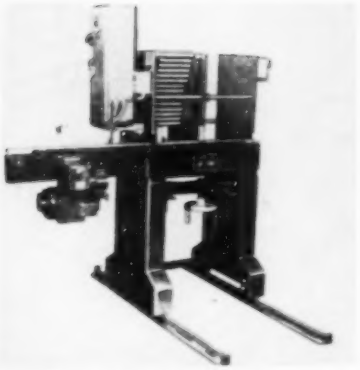


Electromatic Testing Machine Provides Printed Test Data

Important test data such as offset yield strength can be obtained instantly from the new Electromatic testing machine. Data is printed automatically by an electric typewriter used in conjunction with the machine. As set, the data printer will record yield strength by desired percentage of offset, ultimate strength and an identifying test number without operator attention. With this unit, a series of tensile tests can be conducted in rapid sequence.

Electronic signals to operate the printing control mechanism are generated both by the extensometer affixed to specimen, and the Selectorange indicating system. The former supplies data on the amount of strain, while the latter gives the instantaneous load. Machines for automatic printing of other mechanical properties are being developed.

Tinius Olsen Testing Machine Co, 7275 Easton Rd, Willow Grove, Penna



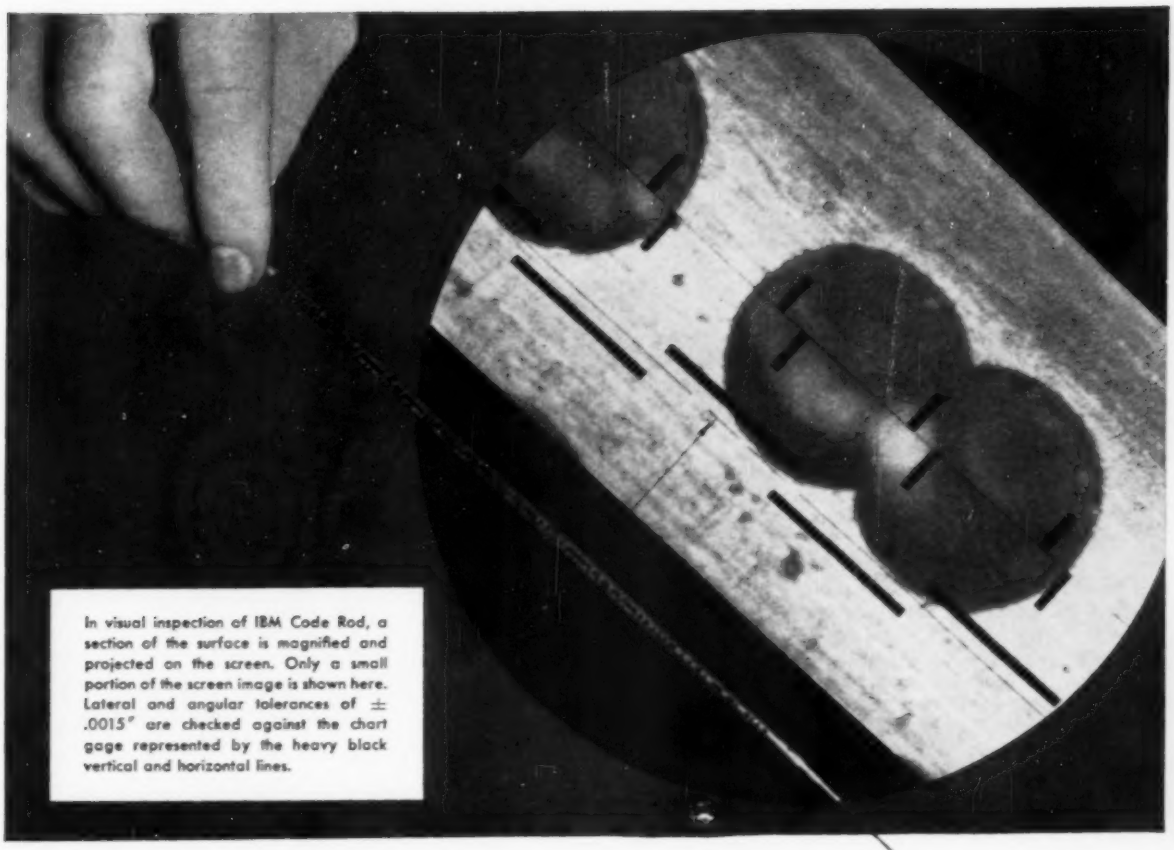
Magazine Loader Feeds Bars In End-to-End Position

Self-contained Model 8000 is designed for automatic feeding of long bars or tubing into centerless grinders, polishing machines, or heat treating equipment. Parts are loaded into hopper, from which they are cycled by an automatic switch, escapement and agitator mechanism to a steel conveyor belt that delivers them to the production machine.

Adjustable hopper handles parts ¼ to 2¼ in. in dia and 3 to 24 in. in length, permits loading up to 2200 ¼-in.-dia pieces. Conveyor is powered by a ¼-hp motor and is provided with a variable speed drive that controls cycling rate and speeds from 5 to 20 fpm. Heights of magazine and conveyor are adjusted by handwheel. Unit's V-track mounting facilitates lining up loader with production machine.

Production Feeders Corp, 5150 Johnnycake Ridge Rd, Mentor, Ohio

HYDRAULIC PORT CONTOUR CUTTERS can produce the AND 10050 hydraulic port contour in steels, including stainless. The cutter can also be used in nonferrous materials. Tool produces the contour in a single pass and, when a reamer pilot is used, also sizes the minor diameter of the Class 3 thread specifications. Shank and body are made of alloy steel. Cutting edges are tipped with tungsten carbide. Tools are available in 13 diameters for all sizes of fittings used with ⅛ through 2-in.-dia tubing—*Sonnet Tool & Mfg Co, 576 N Prairie Ave, Hawthorne, Calif*



In visual inspection of IBM Code Rod, a section of the surface is magnified and projected on the screen. Only a small portion of the screen image is shown here. Lateral and angular tolerances of ± .0015" are checked against the chart gage represented by the heavy black vertical and horizontal lines.

How would you gage these 1,118 holes?

Here's how IBM did it... and smashed an inspection bottleneck

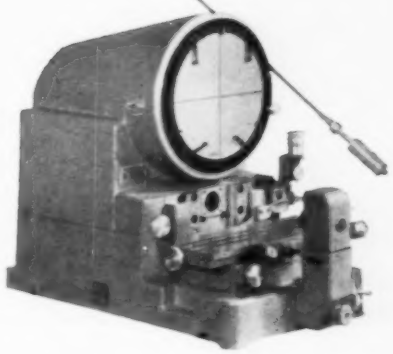
Here's how International Business Machines Corporation boosted the inspection rate on its new Code Rod from 1 or 2 *per day* to 15-20 *per shift*—keeping pace with production, yet maintaining complete accuracy—with a Kodak Contour Projector, Model 14-2A.

The Code Rod is used with the new 720 High Speed Wire Printer, developed by IBM to overcome the speed limitations of conventional bar type printers. The rod is a stainless steel tube with no less than 1,118 1/32" holes. The holes are drilled in various combinations at 7 different intervals in 7 straight rows down the 8" length of the tube. Obviously the inspection problem is of no small proportions.

Lateral and angular tolerances for the holes are ± .0015". *To maintain these tolerances is critical because any mis-drilled holes would cause an error in the shape of the characters to be printed.* What's more, the 720 Printer operates at extremely high speeds, and any slight error could affect its operation.

In visual inspection a master Code Rod is placed next to the rod to be inspected. Both surface images are projected on the screen. The operator simply indexes the image along simultaneously, so that he always has a correct rod in view for comparison of the hole grouping. He checks tolerances by a chart gage on the projector screen.

Got an inspection bottleneck at your plant? Optical gaging with a Kodak Contour Projector may well be the answer. The booklet "Kodak Contour Projectors" gives examples of how other firms are profitably using Kodak Contour Projectors, plus full data on the various models we offer. The booklet is available on request from:



Kodak Contour Projector, Model 14-2A, is a versatile precision measuring instrument for production lines or toolroom. It is one of 6 Kodak Contour Projector models available to meet all your optical gaging needs. Operators work in complete comfort, need little training.

Apparatus and Optical Division

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

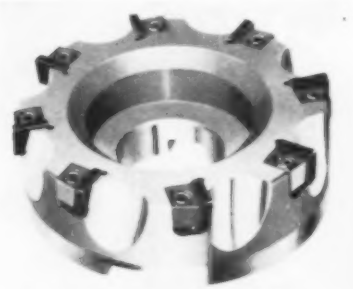
the KODAK CONTOUR PROJECTOR

Kodak
TRADE MARK

Flush Pin Gage Line Provides Wide Range Measurement

A new line of standard bar- and barrel-type flush pin gages provides over 650,000 variations in the make-up of a gage. Either finished or blank gages can be supplied. The new dial indicator gage housing, designated Model R, places no balls or pins between the contact point and the gaging pin. This is said to decrease dimensional errors and lower the cost of the unit. Model R allows a ⅜-in. vertical adjustment of the indicator, permitting depth gages of a given pin length to be used over a greater range.

Rite-O Tool & Gage Co, 321 West Ten Mile Rd, Hazel Park, Mich

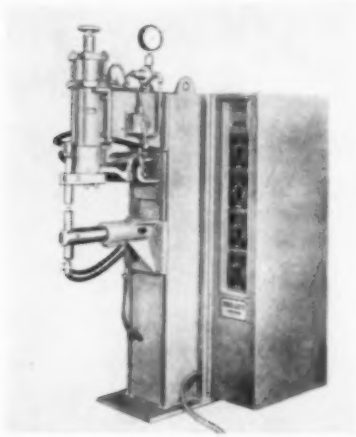


Indexable Blade Milling Cutters Designed for Max Chip Disposal

Outsize chip gullet in front of blades of Model Z permits depths of cut up to ½ in. with ample chip clearance. Square, case-hardened wedge located behind blades provides larger, deeper chip pocket directly in front of blades. Accuracy of cutter body is protected even in cases of serious accidents since inexpensive, replaceable wedge takes brunt of any smashup.

Cutters are made with double negative or positive rake angles, depending upon material to be cut. Standard stock sizes range from 2 to 12 in. in dia, use ¾-in. sq by 3/16-in. thick throwaway carbide inserts that can be indexed eight times on negative rake cutters, four times on positive.

Futurmill, Inc, 6360 Highland Rd, Pontiac, Mich



Sciaky Spot Welder Available In 30, 50 and 75-kva Ratings

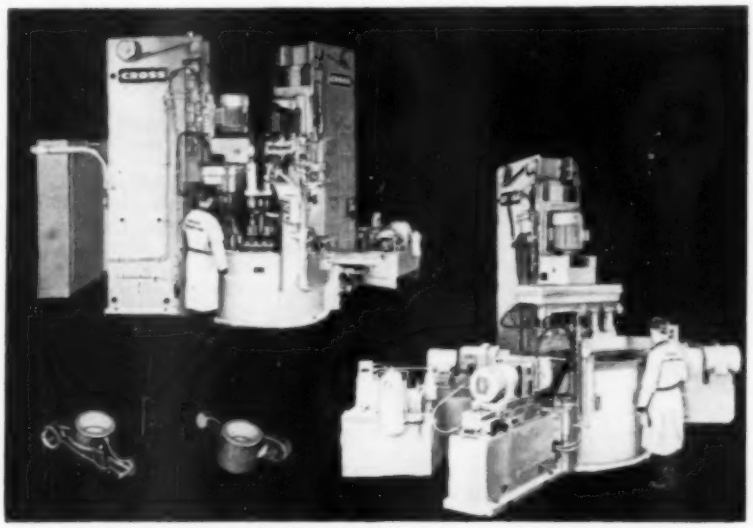
Model SP 1 spot welder is an air-operated, press-type unit designed to cover a wide range of commercial welding applications. It is one machine in a series of frame sizes ranging from 1 SP through 5 SP.

Available in 30, 50 and 75-kva ratings at 50% duty cycle, the SP 1 can be furnished with 18, 24, 30, 36 and 42-in. throat depths. Electrode force up to 1575 lb is provided at 80 psi line pressure.

Other features include pneumatic, double-acting cylinder head; recirculating ball-bearing guided ram; low impedance secondary circuit; and fully adjustable, copper alloy lower arm. Bulletin 3242R.

Sciaky Bros, Inc, 4915 W 67th St, Chicago, Ill

PORTABLE PNEUMATIC POWER SAW and file is designed for rapid keyhole, deadend, and scroll cutting on plastic materials. Operating speed and cutting stroke are easily adjusted—*Air-Speed Tool Co, 1502 W Slauson Ave, Los Angeles, Calif*

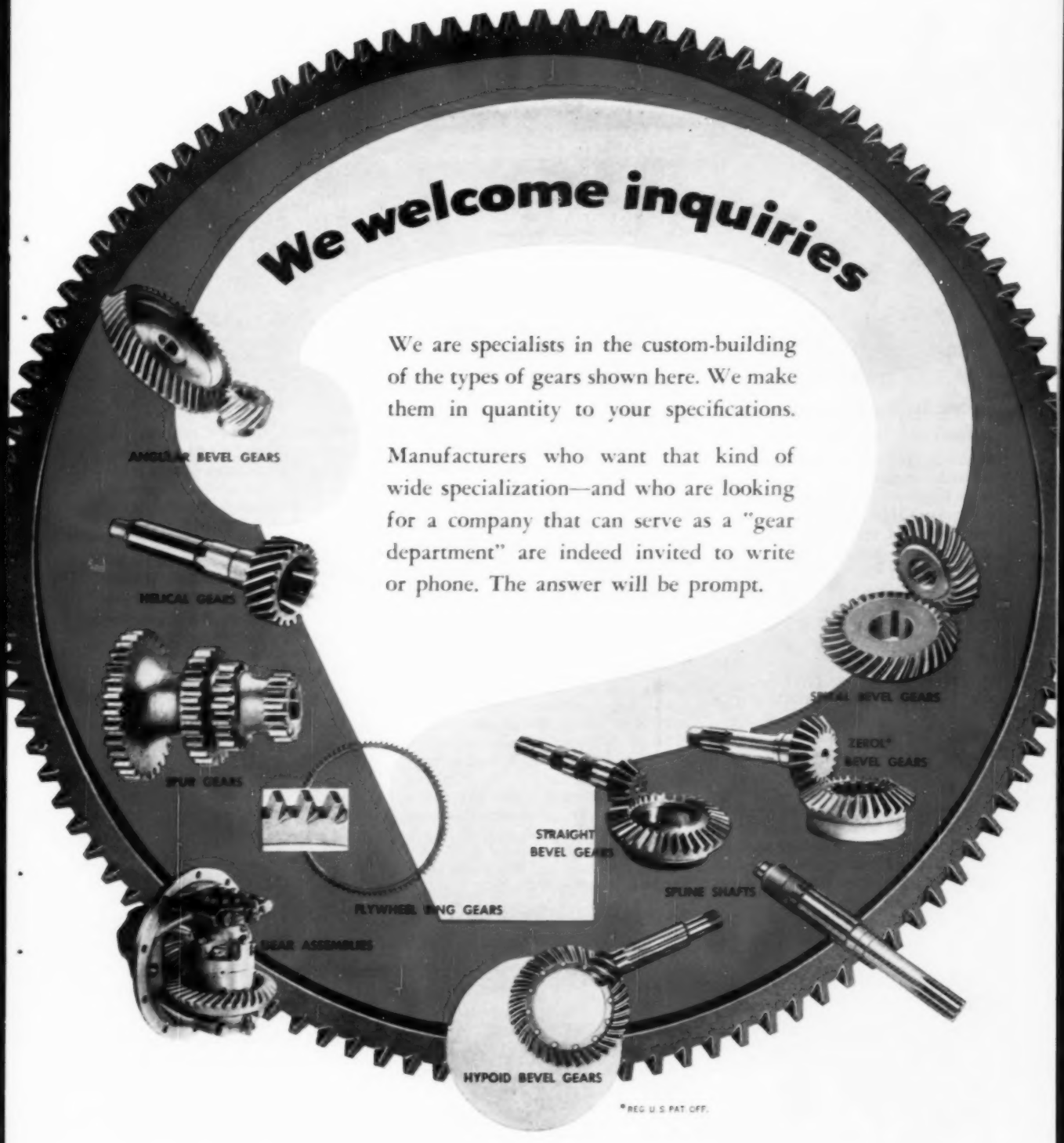


AUTOMOBILE VALVE ROCKER ARMS are processed at the rate of 800 per hr on two six-station dial types machines. One machine drills and reams the rocker shaft hole, forms the oil groove and drills one oil hole. Other machine drills, chamfers and taps the adjusting screw hole; and drills, counterdrills and spotfaces a second oil hole. Machines feature hydraulic feed and rapid traverse for drilling and reaming, individual leadscrew feed for tapping, and pre-set tooling—*Cross Co, Park Grove Station, Detroit 5, Mich*

We welcome inquiries

We are specialists in the custom-building of the types of gears shown here. We make them in quantity to your specifications.

Manufacturers who want that kind of wide specialization—and who are looking for a company that can serve as a "gear department" are indeed invited to write or phone. The answer will be prompt.



*REG. U. S. PAT. OFF.

EATON

AUTOMOTIVE GEAR DIVISION
MANUFACTURING COMPANY
RICHMOND, INDIANA

GEARS FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS ®
GEAR-MAKERS TO LEADING MANUFACTURERS

CYLINDER LINERS MACHINED

Thread Rolling Machine Provides In-Feed and Thru-Feed Rolling

Model B 111 two-die, horizontal, cylindrical thread rolling machine is especially suited for high production and job shops and for both in-feed and thru-feed thread and form rolling on large and small production runs. During the rolling operation, one rotating die remains in a fixed position and the other is movable. The movable die is fed into the work by a cam-actuated head which provides for positive control of the feed and size through uniform penetration rates and predetermined length of dwell.

Standard work rest blades and standard work stops are available for in-feed rolling. Work diameters up to 2 in. can be handled by the in-feed method; up to ¾ in. by thru-feeding. Thread lengths up to 1⅞ in. can be rolled by the in-feed method; up to 20 ft by the thru-feed method. Machine is operated through a push-button controlled 5-hp motor.

Machine can be used for manual, semi-automatic, or completely automatic feeding. Floor space for in-feed rolling is 40 x 39 in.; working height is 42 in.

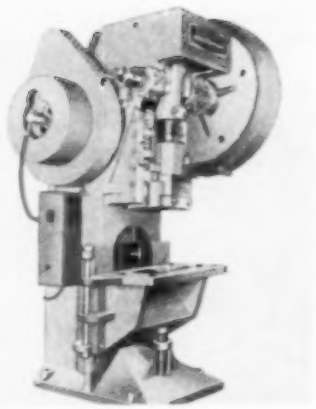
Reed Rolled Thread Die Co, PO Box 330, Worcester 1, Mass

Spade Drill Speeds Hole Cutting In Hard-to-Machine Metals

Designed to speed the cutting of holes in heat-treated alloy steels, stainless steel, titanium and other hard-to-machine metals and castings, these spade drills are made of the new M-3 type HSS. Tools are said to increase production 5 to 8 times when compared with the well-known 18-4-1 HSS tools.

Long blade knife is insured by coolant circulated internally through the shank and directed outwardly against each cutting edge. Each shank accommodates several different blade sizes. Blade design provides more chip clearance than twist drills and has the additional advantage of being easily reground to smaller diameters when edges become worn. Drills are available in sizes from 1 1/16 to 5 in. OD; larger sizes on request.

Robert H Clark Co, 9330 Santa Monica Blvd, Beverley Hills, Calif



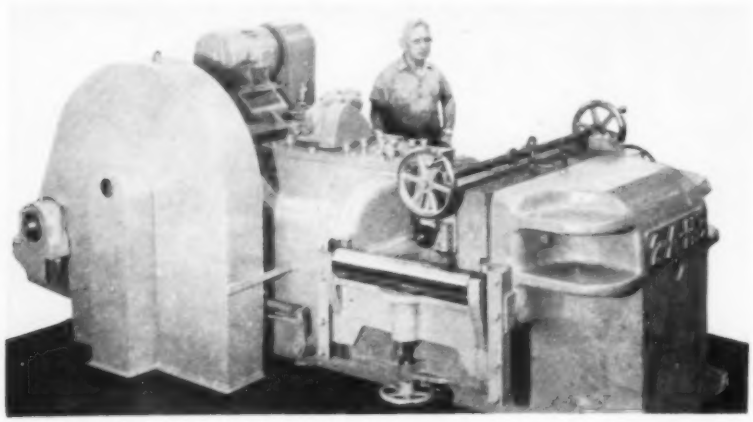
HORN PRESS, 60-ton capacity, is designated H-60 and is offered in both flywheel and single back geared models. Air clutch and electrical controls are standard features. Distance from table to slide is 9 in., with standard 4-in. stroke down and the adjustment up. On special order, this can be increased to 33 in. Crankshaft strokes up to 12 in. are also available. Press is available with horn and adjustable table. Bulletin available—*Johnson Machine & Press Corp, 620 West Indiana Ave, Elkhart, Ind*

Hobart Inert Gas Welding Outfit Carries Its Own Water Supply

This ac-dc inert-gas shielded-arc welder is equipped with a Circoolator (a water tank with motor driven pump), and is designed for large operations where the welding machine is needed at different stations. The Circoolator provides an independent water supply for cooling the welding torch. On top of the 20-gal water tank is an all-bronze, rotary gear pump coupled to a 1/3-hp motor for operation on single phase, 60 cycle, 110 volts.

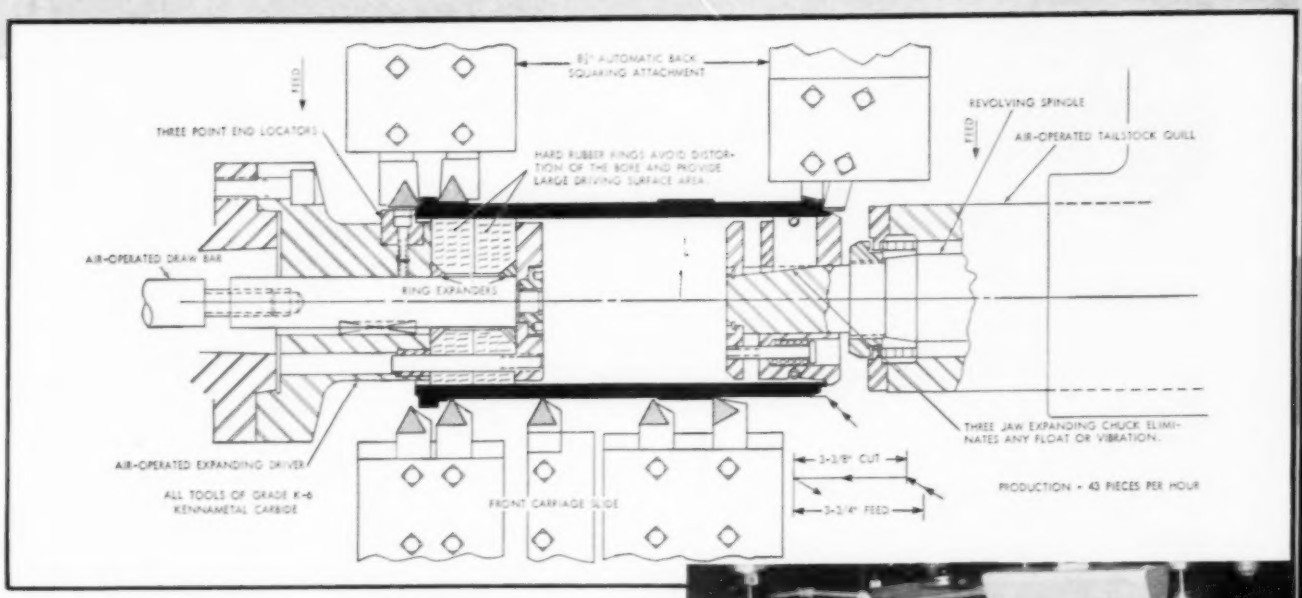
Unit is available with solid rubber or steel wheels and is knocked down for shipment.

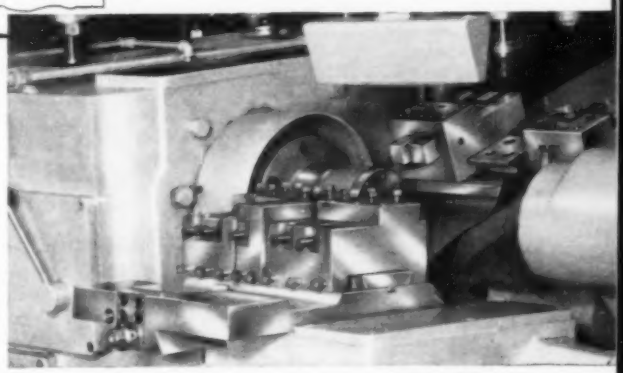
Hobart Bros Co, Hozart Square, Troy, Ohio



HORIZONTAL BENDER AND STRAIGHTENER, No 2A, has 150-ton capacity; 1¾-in. stroke; 8-in. adjustment of ram (by power); 31¾-in. die space (ram forward, adjustment back); 40 spm. Unit is available with or without an automatic-stop, jaw-type clutch controlled by treadle—*Williams-White & Co, 700 Third Ave, Moline, Ill*

CYLINDER LINERS MACHINED ECONOMICALLY ON Lo-swing LATHES


FEED
THREE POINT END LOCATORS
8½" AUTOMATIC BACK SQUARING ATTACHMENT
HARD RUBBER RINGS AVOID DISTORTION OF THE BORE AND PROVIDE LARGE DRIVING SURFACE AREA
REVOLVING SPINDLE
FEED
AIR-OPERATED TAILSTOCK QUILL
AIR-OPERATED DRAW BAR
RING EXPANDERS
THREE JAW EXPANDING CHUCK ELIMINATES ANY FLOAT OR VIBRATION.
AIR-OPERATED EXPANDING DRIVER
ALL TOOLS OF GRADE K-6 KENNAMETAL CARBIDE
FRONT CARRIAGE SLIDE
3-1/8" CUT
3-1/4" FEED
PRODUCTION - 43 PIECES PER HOUR

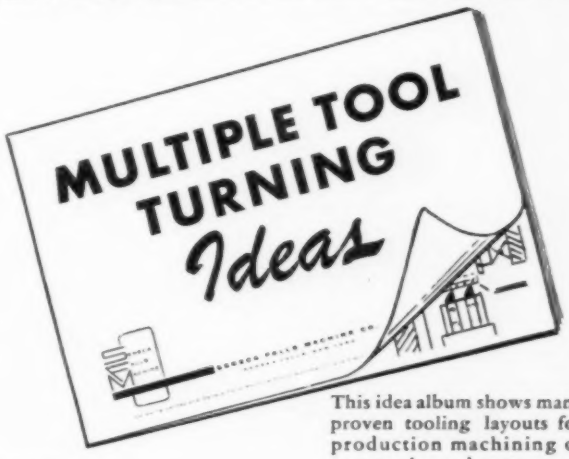


PROBLEM: To turn... without distortion... as well as face and chamfer, various cast, thin wall Diesel Cylinder Liners.

SOLUTION: The Model AR Automatic Lo-swing Lathe was selected for this job as it has: (1) *Necessary rigidity* for utilizing carbide tools. (2) *Simplified Change-Over Mechanism,* permitting all cams to be pre-set to graduated dials for length of cut. (3) *Instantaneous Tool Relief Control Mechanism,* which permits reversing carriage and slide feed movements without disturbing timing of slides or adjustment of the tools.

The Cylinder Liners are driven on the headstock end with a special driver which permits high cutting speeds and coarse carriage feeds without distortion. The tailstock end of the liner is supported with an expanding chuck operating under controlled air pressure to prevent distortion. All turning, facing and chamfering operations are performed simultaneously. The entire cycle is automatic; the operator simply loads and unloads the parts and pushes the starting button.

PRODUCTION!!! 43 pieces per hour at 100% efficiency. Seneca Falls engineers find solutions for the most difficult turning problems and are at your service.



This idea album shows many proven tooling layouts for production machining of commonly used parts.

SENECA FALLS MACHINE
ENGINEERED FOR PROFIT

MAIL THIS COUPON

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Your Free Copy

SENECA FALLS MACHINE CO.

SENECA FALLS, NEW YORK

Lo-swing Lathes and Seneca Falls Machine Tools, Automation and Electronics

Send a free copy of "Multiple Tool Turning Ideas" to:

Name .....

Company .....

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NEW SHOP EQUIPMENT

Electrode, Easyarc 30, is a mild steel iron-powder-type electrode designed for fabrication of large weldments such as structural frames and machine bases. Rate of deposition is 17 lb per hr. As-welded properties include tensile strength of 63,650 psi; yield strength, 52,400 psi; elongation (in 2 in.), 33%; and a 49.9% reduction of area. Electrode is ¼ in. in diameter, 18 in. long.

Air Reduction Sales Co, Div of Air Reduction Co, Inc, 150 E 42 St, New York 17, NY

Ultrasonic testing transducer, Type Z, can be used on materials which have previously been difficult or impossible to test with standard transducers. Because of unusually high resolution, the probe will detect flaws which are very close to surface of material. Sensitivity is reportedly much greater than that of quartz, noticeably more than conventional barium titanate, equal to that of lithium sulfate. Immersion-mounted units are completely waterproof and designed for continuous operation at up to 250 F.

Branson Instruments, Inc, 40 Brown House Rd, Stamford, Conn

Welding attachment, for factory installation only on company's motor-generator arc welders, is designed for critical TIG welding applications where extremely low ripple (1 to 2%) dc welding current is required to weld such metals as stainless steel, high carbon steel, cast iron, silicone bronze, deoxidized copper and silver. The high frequency unit, complete with gas and water valves, mounts at side of welder control panel.

Hobart Brothers Co, Hobart Square, Troy, Ohio

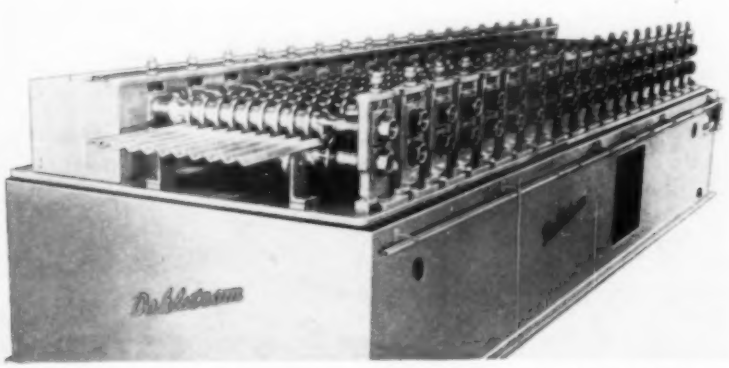
Power feed to the table is now available on the company's 18 in. face grinder. A hydraulic power system with a 2-hp, 1200-rpm motor provides the equivalent of a 50-lb push at the handwheel, which amounts to 600 lb at the table. Max cutting speed is 25 fpm; return is 42 fpm. Power unit is interlocked with table handwheel.

Abrasive Machine Tool Co, East Providence, RI

Ball peen hammer, designed to minimize chipping of critical areas and assure safety for the user, is treated on the chamfer by induction heat treatment to produce a lower degree of hardness on the rim. Face hardness is maintained. The polished Model 316 ranges in weight from 4 oz to 40 oz and is priced at $2.95 to $4.30. The black finish models, 4 oz to 40 oz, sell for $2.35 to $3.75.

Stanley Tools, Div of Stanley Works, 111 Elm St, New Britain, Conn

Radius form tools, tradenamed Jet-Cut A, are made from special high speed steel and are recommended for operations requiring toughness and a fine cutting edge. Six styles of concave and convex tools are offered, with radii from 1/32 to 1/16



ROLL FORMING MACHINE for corrugating sheets of galvanized steel, aluminized steel, plain and embossed aluminum, can handle gages 20 through 28 (other ranges available to meet requirements). Features include all welded construction; roll shafts mounted on anti-friction bearings; only vertical adjustment required for gage range; operating speed, 150 fpm. Roller die tooling is available for ½ or ⅞-in. depth with excellent control of coverage and depth reported—*Dahlstrom Machine Works, 4227 W Belmont Ave, Chicago 41, Ill*

(Advertisement)

Meet BERNARD C. DAY

... one of Bryant's internal grinding experts, who helps solve grinding problems for customers throughout the Cleveland territory. Mr. Day can be reached at Center West Bldg., No. 307, 20950 Center Ridge Road, Cleveland 16, Ohio. Tel. Edison 1-9626.

Gears like these, ground on a Bryant 3216, are typical of the precision items made by Dana Corp.

Address

Q. **Why does Dana Corp., Toledo, Ohio, use eight Bryant 3216 Internal Grinders?**

A. **"The Bryant 3216 produces more parts for less money . . . gives better quality than manually operated machines . . . holds size consistently and finishes better."**

The Toledo Division of Dana Corp., specializes in making a great variety of parts: transmissions, universal joints, propeller shafts, forgings, gear boxes and torque converters, to name only a few.

In the words of a company official, Dana is "a sort of glorified jobbing shop ... our runs are comparatively short, and quick changeover ability is a key factor in our operation."

At Dana, the Bryant 3216 Automatic Internal Grinder has proven superior to other makes. The company first bought four 3216's, and then, because of their excellent performance, bought four more.

Here are some of the things Dana likes about Bryant 3216's: —

"they're economical . . . we're able to have one man run two machines, and cost is cut to about 60% of single-machine operation."

"the 3216 holds size consistently and finishes better."

"holds tolerance very well . . . you can depend on it to do the job it is supposed to do."

"there is almost no maintenance . . . these machines have run trouble-free since we've had them."

"simple to operate . . . easy to adjust . . . hold close tolerances . . . meet all our requirements."

Learn how the Bryant 3216 Automatic or other Bryant machines can help *you* in your internal grinding operations. Write today for literature.

BRYANT Chucking Grinder Co.

10 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Internal & External Thread Gages • Granite Surface Plates • Magnetic Drums for Computers • Special Machinery

Stick to standards and save

You can save on engineering and manufacturing costs by building your *special* machines the same way Baker does — out of Baker's *standard* components. Build with standard hydraulic slides and power units . . . one of the Baker Basic models will fit 9 out of 10 applications. You save, and you actually get a better machine from Baker design-tested components.

BAKER

AUTOMATION

Best in the long run
Practical in the short run

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NAME AND TITLE

COMPANY

ADDRESS

CITY ZONE STATE

BAKER BROTHERS, INC.
Dept. AM-18, Toledo 10, Ohio

Send me prices and comprehensive 2-page data-spec-dimension sheets on these standard Baker components . . .

BAKER BASIC HYDRAULIC SLIDES

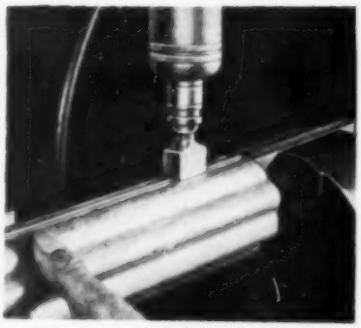
CHECK HERE	WIDTH OF WAYS	CAPACITY HP MAX.
( )	11	5
( )	12	15
( )	18	15
( )	18	25
( )	20	50

( ) Drive box for above slide
( ) Porta-Pak hydraulic power unit
( ) Standard index tables

NEW SHOP EQUIPMENT

in. by 64ths, and up to 11/16 in. by 32nds. Tool shank sizes available are ¼, ⅜, ½, ⅝ and ¾ in. square. Both RH and LH cutting tools are included in line.

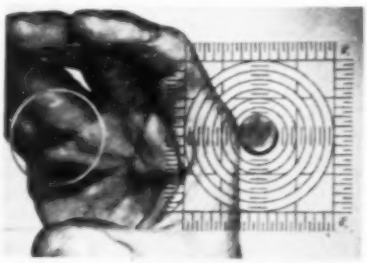
Lund Mfg Co, 469 Elm St, Biddeford, Me



LOCK SEAM SEALER, Ram-Ex, is designed to close any size lock seam in sheet metal up to 18 gage. Raised step on the tool furnishes only guide necessary—*E V Nielsen, Inc, 129 Broad St, Stamford, Conn*

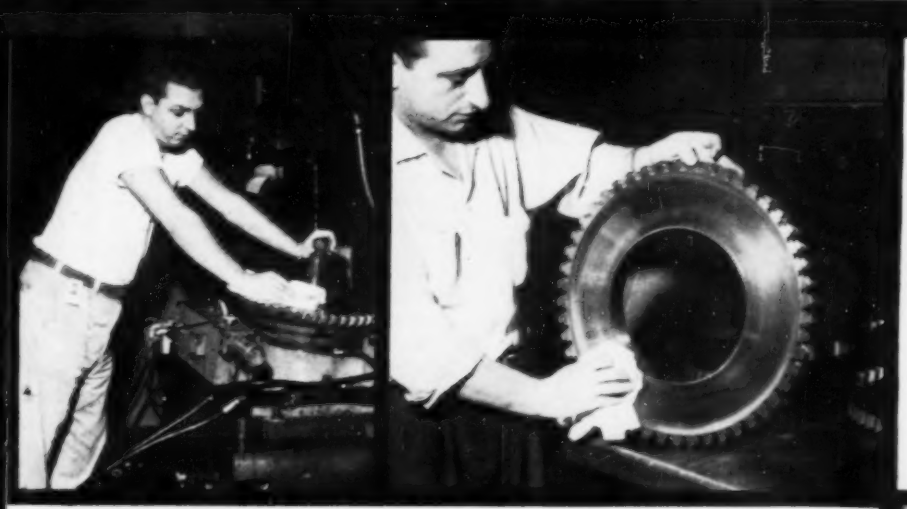
Cutting tool material, Ceramic VR-97, is suitable for speeds of 2000 sfpm and up, feeds to 0.020 in., and cuts to depth of ⅜ in. Another material, VR-54, of milling cutter grade tungsten carbide, is designed for cutting chilled iron, cast iron, nonferrous and nonmetallic materials.

Vascoloy-Ramet Corp, Subsidiary of Fansteel Metallurgical Corp, 800 Market St, Waukegan, Ill



LATHE AND DRILL GAGE is printed with series of circles with diameters from ¼ to 2 in. Fine lines between circles locate centers of round stock with diameters from ⅝ to 1⅞ in. Ruled calibrations on four sides can be used for locating matching dowel centers as well as for measuring diameters of 13 sizes of round material—*Dawn Crafts Co, 215 Commonwealth Ave, Buffalo 16, NY*

Four-way slide valve, designed to actuate pneumatic equipment, controls automatic advance and retraction, offers adjustable dwell time and



people
buy
Scott Wipers
for
many
reasons:

Curtiss-Wright likes "safety and savings" of Scott Wipers!

Soft, highly absorbent Scott Wipers have been performing efficiently for 3 years throughout the Wright Aeronautical Division of Curtiss-Wright Corporation, Wood-Ridge, N.J. Fresh Scott Wipers—right out of a box at each work station—eliminate the hazards of cuts and scratches from clinging metallic chips and shavings. Disposable Scott Wipers are burned each day. And as Mr. J. Boydell, Machine Shop Foreman, says: "We keep Scott Wipers so busy, we don't really have time to keep checking the savings they effect—but we're not worried! Our experience with Scott Wipers tells us that we're getting *all* the special advantages these wipers are known to offer!" He adds that savings are "sizable."

SCOTT PAPER

Maker of the famous Scott paper products you use in your home. See "Father Knows Best" and "The Gisele MacKenzie Show" on NBC-TV.

Find your Scott distributor in the Yellow Pages under "Paper Towels." He has the Curtiss-Wright case history for you, with complete facts and figures . . . and many others, covering many fields. Or write: Scott Paper Company, Dept. AM-81, Chester, Pennsylvania.

Curtiss-Wright uses Scott Wipers for wiping parts before broaching, broaching machines themselves, grinding machines, and at inspection stations. They are soft, yet tough—and their wet strength makes them ideal for wiping up oils and coolants.

AUTOMATIC CHUCKING MACHINE

There are no half-finished pieces lying around at the end of the day when you put your work on this outstanding machine.

The "1-2-3" feature—available only on the Goss & De Leeuw Automatic Chucker —provides the means of finish machining three ends of a part without changing set-up.

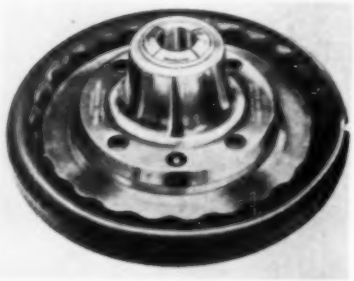
Note some of the typical parts machined. Ask for illustrated literature giving further details and send samples of your work for a cost estimate on handling it on the Goss & De Leeuw.

GOSS and DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

NEW SHOP EQUIPMENT

speed control. Designated the Control-Pac, valve can be used effectively to obtain reciprocating action of double-acting cylinders with either long or short stroke. Outside dimensions are 3 x 2 x 6⅞ in., including solenoid pilot valve.

Dixon Automatic Tool, Inc, Rockford, Ill



Hardinge-Sjogren Collet Chucks Increase Capacity, Production

Increased capacity from 25 to 40%, and greater precision production are claimed for new speed collet chucks introduced by H-S. Units are designed for use on all types of toolroom lathes, engine lathes, and grinders.

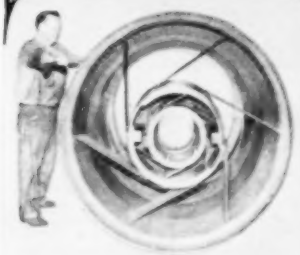
Features include accurate holding of any bar that can be passed through the spindle without unwieldy draw tube and adapter or sleeve inside the spindle hole found on usual collet attachments. Full range of collet tension from light to heavy holding power is possible without use of keys or wrenches. Model uses lowcost regular steel collets for max efficiency and minimum cost. Complete operation from front position is possible with the hand wheel (supplied in either 7¾ or 10-in.-dia) or lever-operated type. Bulletin 8B.

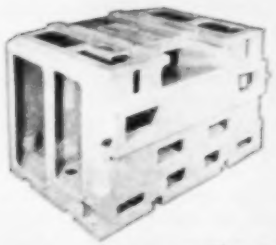
Hardinge Brothers, Inc, 1420 College Ave, Elmira, NY

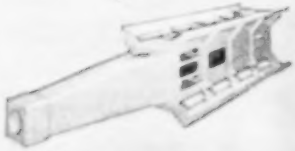
Diamond mounted points and hones have been added to company's industrial products line. Mounted points come in sizes ranging from 3/32 to 1 in. in diameter and the hones in standard sizes, with specials available. A special blending process controls concentration and distribution of diamond in the resinoid-bonded tools, assuring rapid cutting and long life. Points are mounted on solid-carbide shanks.

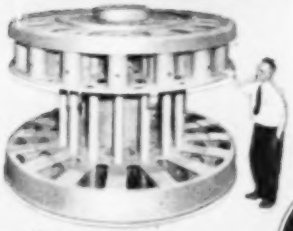
Elgin National Watch Co, Abrasives Div, Elgin, Ill

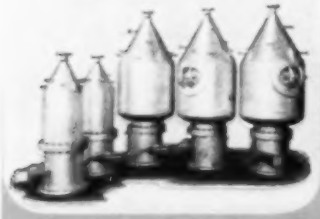
Steel-Weld FABRICATION











Use WELDED STEEL for Greater Strength with Less Weight!

The weldment shown above is the frame for a sixteen cylinder Diesel Engine designed for a potential of 5000 H.P. This precision piece, and those illustrated at the left are typical of thousands of Steel-Weld Fabricated parts and assemblies produced by Mahon each year for manufacturers of processing machinery, machine tools, and other types of heavy mechanical equipment. If you are not now taking full advantage of the economies offered by welded steel components in your product, you should give the matter serious thought. In the design of almost any type of heavy machinery there are parts and sub-assemblies that can be produced more economically, more satisfactorily, and in less time, in welded steel. In weldments you get greater strength with less weight—plus the additional advantages of greater rigidity and 100% predictability. When you consider weldments, you will want to discuss your requirements with Mahon engineers, because, in the Mahon organization you will find a unique source for weldments or welded steel in any form . . . a fully responsible source with complete facilities for design engineering, fabricating, machining and assembling . . . a source where design skill is backed up by craftsmanship which assures you a finer appearing product embodying every advantage of Steel-Weld Fabrication. See Sweet's Product Design File for information, or have a Mahon sales engineer call at your convenience.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

Sales-Engineering Offices in Detroit, New York and Chicago

Engineers and Fabricators of Steel in Any Form for Any Purpose

MAHON

WELLS HORIZONTAL METAL CUTTING BAND SAWS

The simple design and rugged construction of every "Wellsaw" didn't just happen. We planned it that way! Over 30 years of specialized band saw experience and know-how is your assurance of the quality and service with each machine produced by Wells Manufacturing Corporation.

There is a Wells Saw of the right style, capacity and speed to do a better, more economical job for you. Wells Saws will deliver long, dependable service. Operating and maintenance costs are very low.

Your Wells Distributor will help you analyze your requirements and select the proper model Wells Saw for your jobs.

TWO WIDELY USED WELLS SAWS

	MODEL 600	NO. 8
Capacity, Rectangular	6" x 13"	8" x 16"
Capacity, Rounds	6¾"	8"
Speeds: Ft. Per Minute	50, 90, 160, 250	50, 100, 175, 275
Motor Size	1/3 H.P.	½ H.P.
Blade Size	⅝" x 8'2½"	¾" x 11'6"
Height to top of Bed	25½"	25½"
Width of Bed	8½"	10¼"
Floor Space	21" x 50"	24" x 72"
Shipping Wt. (approx.)	425 lbs.	650 lbs.

Wells SAWS
Wells

The Pioneers of Horizontal
METAL CUTTING BAND SAWS
WELLS MANUFACTURING CORPORATION
505 Roosevelt Road, Three Rivers, Michigan

Round Table...

MANAGER OR SUPER MECHANIC?

Does a foreman have to know everything about the equipment in his department—to the extent of being able to repair breakdowns—or should he concentrate on being a skilled administrator?

FOREMANSHIP is an important position because a foreman must perform a dual function: that of a works manager and that of a personnel manager on the working floor level. Because of this, his selection should be based on the general industrial demands in a particular manufacturing field, and on the plant requirements in a particular locality.

A foreman should be in almost all instances a 50-50 man, an observant and alert individual skilled in the exact or a similar trade that he is supervising, as well as able to understand many facets of human behavior. In addition, he should be a calm planner commanding respect from actions and composure rather than from a harsh, nagging voice and semi-brutal actions. Finally, he should be a fair judge and a friendly instructor who can inspire bigger and better output by individuals and the whole group. It must be understood that with certain hot-headed individuals he must be firm, even dictatorial, rather than purely assuaging.

In smaller, usually non-unionized plants, where the number and combination of machines are limited, and the laboring force not too big,

(Continued on page 177)

"Think hard, man. How could you misplace a two-and-a-half-ton lathe?"

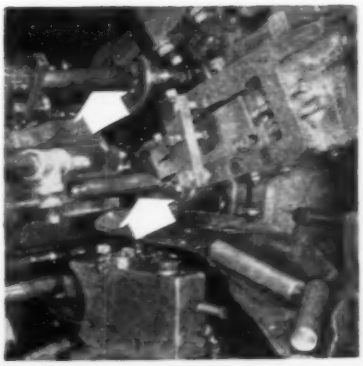
Studs for NELWELD process machined from Youngstown cold finished bars

Progressive fabricators rely on the Nelweld method for fast, dependable end-welding of studs to steel surfaces. This novel electric arc process—utilizing flux-filled steel studs—substantially reduces direct fastening costs when used to replace conventional time-consuming methods such as drilling, tapping, hard welding, through-bolting or the securing of straps and rivets.

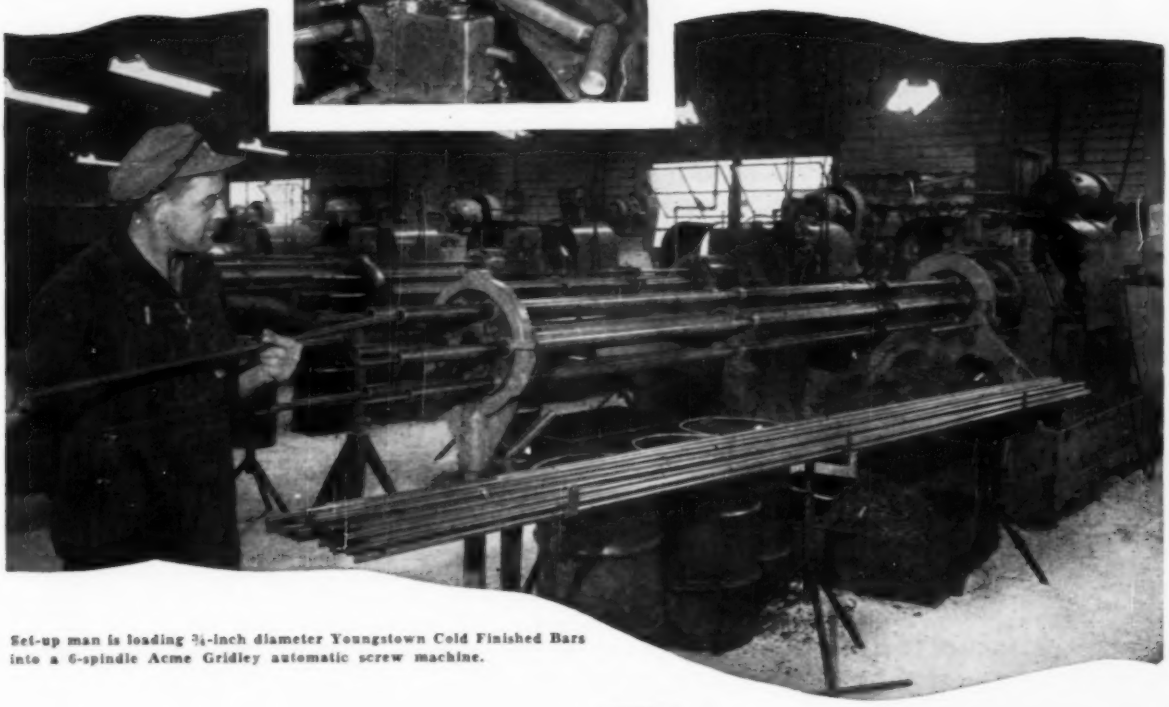
To maintain their world-wide reputation for product quality and uniformity, Nelson Stud Welding, a division of Gregory Industries, Inc., uses Youngstown Cold Finished Bars as the basic material for stud production.

Youngstown Cold Finished Bars provide high machinability and greater uniformity of composition, structure and surface finish to help you increase production of more uniform parts. Always specify Youngstown—it's your best assurance of quality.

Why not call or write your nearest Youngstown District Sales Office today for additional information or metallurgical assistance?



Close-up of studs being bored to accomodate their charge of flux (top collet) and then cut-off (center collet). Two finished Nelweld studs, shown in the pan in foreground, were machined simultaneously in the 6-position machine. First operation—feed out and face; second—bore; and third—cut-off.



Set-up man is loading ¾-inch diameter Youngstown Cold Finished Bars into a 6-spindle Acme Gridley automatic screw machine.

THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon, Alloy and Yoloy Steel
General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities

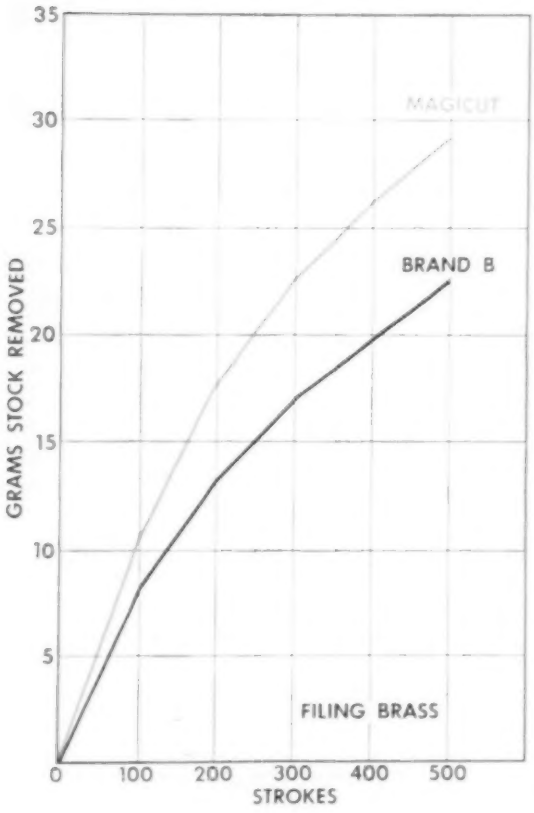
QUALITY YOUNGSTOWN SERVICE

Cold finished bars

Laboratory report:

New "Magicut" file outperforms other types by wide margins on varied industrial metals

Only way to prove what the new Nicholson or Black Diamond "Magicut" All-purpose Machinist's file will do for you is to try it in your plant.



But we've conducted some laboratory tests. Results of these will give you an idea of the savings you can expect with this unique new file. We compared "Magicut" with all kinds of Machinist's files—old and new, ours and others. (Of course these were *hand* tests.)

In just one part of these trials—comparing our new file with another described as being similar in purpose—we found these percentage superiorities for "Magicut": 23.8% over Brand "B" on brass (shown in chart) . . . 24.7% on aluminum . . . 16.2% on magnesium . . . 15.4% on .70 carbon steel . . . and 11.4% on copper. *And these figures have been confirmed in the field.*

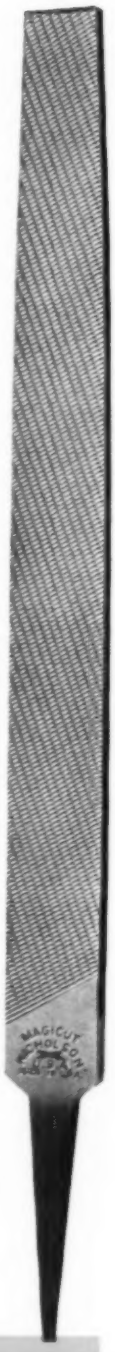
There's not another file that can cut your metal filing costs like the Nicholson or Black Diamond "Magicut" can. Because not another file has the "Magicut's" Penetrating Planer-type Teeth. These rough and smooth industrial metals in a single stroke. You need fewer files —fewer strokes per job.

"Magicut" is the cost-cuttingest file you can use. Available right now in Flat, Half Round and Square shapes . . . 8", 10", 12" and 14" lengths. See and try "Magicut" soon.

FREE! Complete reports of "Magicut" laboratory findings. Send for this authoritative guide to lower filing costs.

Industrial Distributors provide the finest goods and services in the least possible time. Our files are sold exclusively through them.

"Magicut's" perfectly formed gullets eliminate "pinning" and consequent scratching. Note steep-angled serrations which produce maximum cutting surfaces.



NICHOLSON U.S.A. **NICHOLSON FILE COMPANY, PROVIDENCE 1, RHODE ISLAND** BLACK DIAMOND U.S.A.

(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON and BLACK DIAMOND FILES

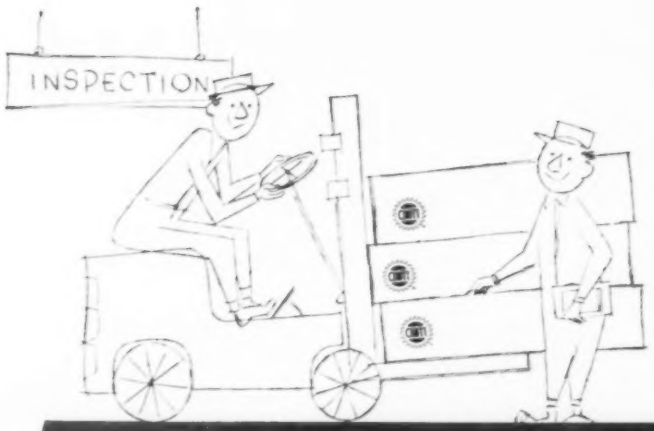
A FILE FOR EVERY PURPOSE

a foreman shuold be mainly a super mechanic and universal man capable and versatile enough to set up machines, inspect jobs, and watch the flow of work. In such an arrangement his human relations and qualifications may be, to a certain degree, placed on a secondary basis, about 70% mechanical ability and about 30% personal ability.

In modern, larger, and fully unionized plants, a foreman must be a 50-50 man equally equipped technically and "humanly." Size of operations together with a larger number of workers, bigger production area, and complexity of automation call for a group of specialists for processing and tooling tasks, job setters, and maintenance men, as well as stock movers, etc. Further, the labor structure requires the necessity of dealing with union representatives or, in particular situations, even with higher levels. Such conditions demand selection of a man with adequate prior shop experience, good employment standing and correct moral standards, who knows and understands the equipment, is capable of thinking intelligently, and is also influential enough to get full cooperation from help directly under him, plus the above listed specialists, as well as cooperation from union stewards or committeemen.

The foreman's job should not be solely accomplished by writing AVO's or requests, but by ability to sell and prove departmental "priority." A good foreman must, however, be careful not to oversell himself, because people will soon spot that he is rushing things and later putting

"Yes, it was my eighth child. Here, Harry, your turn for a puff."



"No need to check those 36" shaved Cincinnati Gears...

those people have the latest inspection equipment!"

Many manufacturers rely on Cincinnati Gear's up-to-the-minute facilities and inspection policies to save this expense in their plants. They know that the "CINTI" trademark on a gear means "to specifications" – because *every* Cincinnati gear is carefully inspected at the factory!

This acceptance stems from a half-century of quality custom gear making. Our production and inspection keep apace with technology through a continuing replacement program which applies to everything except our "old-fashioned" ideas about craftsmanship, service and attention to details.

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You are sure of quality and prompt service when you place your industrial cut gear requirements with SIMONDS GEAR. We produce the full range of sizes in the types and materials you need from your blanks or ours. Let us quote on your next gear requirements.

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Quality Gears for over 65 years

them aside in reserve, and naturally they will be not to keen to cooperate with him.

A foreman should keep his crew busy, because too many idle periods will finally weaken morale and undermine his authority. If possible, he should direct individuals under him to perform tasks they like and are capable of performing best. Further, if possible, he should transfer certain responsibilities to selected workers so that he may be relieved from minor standardized duties. They should report their observations in these cases directly to him. In the case of a foreman supervising a large group of women, he must be capable of dealing with the peculiarities of female mentalities and not be too soft-hearted, or too friendly, with a tendency to show open favoritism.

In summing up, a foreman must be good as a human affairs' coordinator and also equally satisfactory in mechanical and administrative areas.

Many industries today are using foremen as a buffer between unnecessary and selfish fighting among management and union bodies. This is a pitiful setup and can only be deplored as it causes irreparable damage by lowering production. At the very end it can be repeated that a good mechanically inclined man will fail as a foreman if he cannot cope with the "human machine." Same pertains to a philosopher, or a soft, social-working type who cannot easily handle, understand, and live in the daily shop atmosphere with all the problems and limitations of hard-working people.

W S Jaro
Dearborn, Mich

HOW MUCH SHOULD a good foreman know about on-the-job skills in his department? That will depend on where and how the good foreman is employed.

In large factories, organized to the hilt, manual skills are at a discount. If not yet wholly out, they are on the way out. This is the age of specialization; for every conceivable contingency there would seem to be a specialist employed. So far as skills are concerned, the foreman has a large, "wide" and "deep" pool of specialist-guidance to draw on. No longer is he the one and only who carries all the craft secrets under his hat. There are no secrets now in the modern organization, only programs. Everything that anyone might want in a large, up-to-the-minute factory, all information about the product, quality, fits, misfits, etc, is committed to cold print.

The men need hardly be able to read. They are babied along by specialists who read and explain to them the meaning of reams and reams of printed or typed matter relative to their given operation. What with oceans of mute print and herds of articulate specialists, a foreman's life should be a happy one, but is it? Not on your life. He still carries the whole shooting match on his back. He's the bloke what has to see the job out at the door. His knowledge of manual skills is now supposed to be less important than hitherto, but in order to combat the machinations of lordly specialists whose chief claim to our notice is their irritating disinclination to give the job a heave in the direction of the said door, the highly skilled foreman is forever on his toes impressing on them how to cut corners without sacrificing quality. Such knowledge is of immense assistance in honoring delivery promises and can come only from foremen well versed in on-the-job skills.

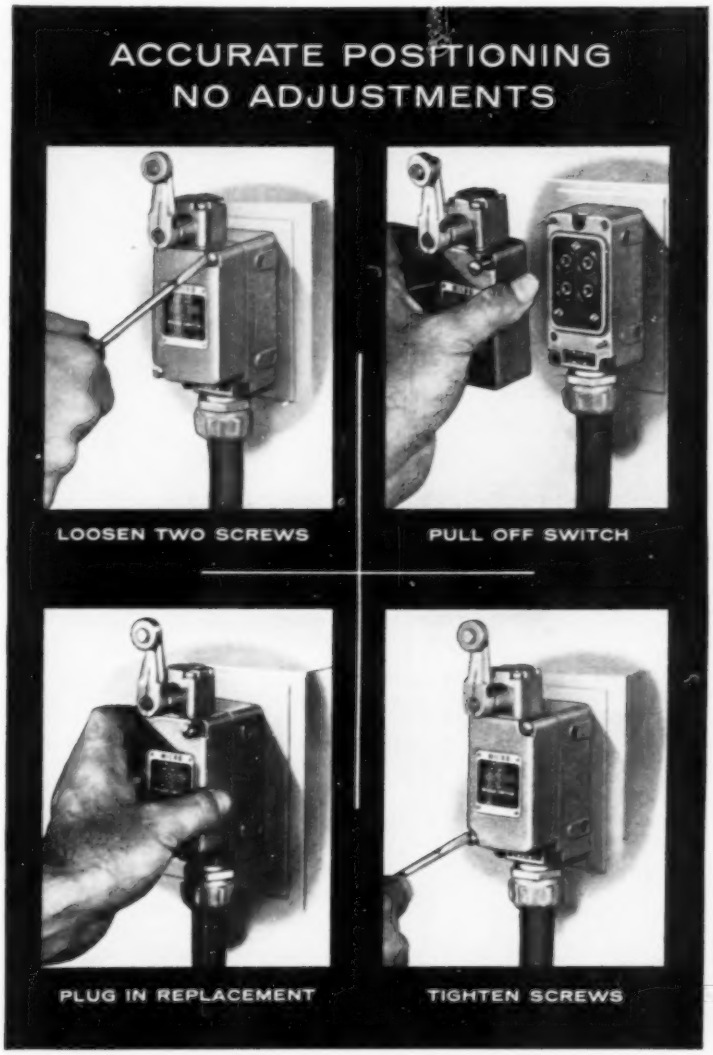
When I contemplate the nature of the assistance afforded the shop foreman by some of those immature specialists, I am reminded of a bachelor who lived in a small house in the country. Musically inclined, his most cherished possession was a grand piano. Moving house, he had all his goods and chattels out in front of his dwelling, but got stuck with the piano. He begged a hand from a passing worker. "You take

(Continued on page 181)

"We're just one big happy family here. In fact, our slogan is "Be Happy or Else!"

MICRO SWITCH Precision Switches

You can replace this precision switch in 20 seconds!

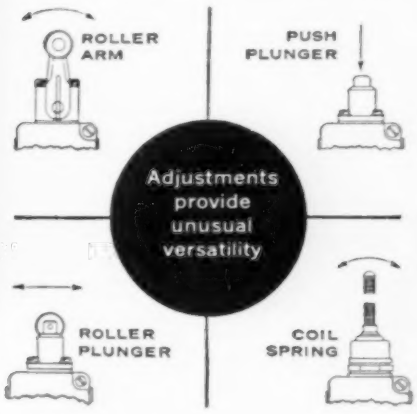


The new MICRO SWITCH "Plug-in Limit" saves many precious minutes of downtime on your high-speed automatic production lines. It plugs in like a radio tube—can be replaced in a fraction of the time required for ordinary limit switches.

This sensational new type "LS" switch offers all the features of rugged construction and precise, long-life operation as the industry-proved "1LS1" switch.

Wiring connections are made to a sealed terminal block enclosure which is permanently mounted to the machine. The switch enclosure, including all moving and mechanical parts, is plugged on to this block and precisely positioned by means of dowel pins.

Actuators available to meet all requirements



MICRO SWITCH "Plug-in Limit" switches are available at authorized distributors in key cities everywhere. Look in the Yellow Pages under "Switches, Electric." Send for Bulletin No. 20.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS

First in Precision Switching

Talking About Die Sets

with

Phil Marsilius

Executive Vice-President
The Producto Machine Co.

How to Select and Order a Catalog Die Set—Do you always order the die set you *really* need for the job...or do you overlook a specification which results in your having to "make do" with the set you ordered or lose time by having to re-order?

Once again, we feel that a simple and basic practice should be emphasized because our daily experiences show that even the most painstaking individual occasionally overlooks one or more factors in preparing to place an order.

Here is our suggested check-list for selecting and ordering a catalog die set:

1. Lay out the die. Allow sufficient area for feeding devices and auxiliary stock guides that may be required. Determine also what areas must be left clear for part ejection or scrap.

2. Determine type of set you need—rear two-pin, four-pin, center-pin, etc.—according to tolerances and construction of die.

3. Place layout on templates for the type of die set you have chosen. Select die area that best meets the limits established in Step 1.

4. Select material for die set—semi-steel, all-steel or combination—based on the die's strength requirements.

5. Select thicknesses of punch and die holder in line with strength requirements and allowable press shut height.

6. Determine length of guide-pin required*, based on length of stroke or ram clearance.

7. Determine type and length of bushing and material from which it should be made, based on accuracy, speed of operation and required life expectancy of die.

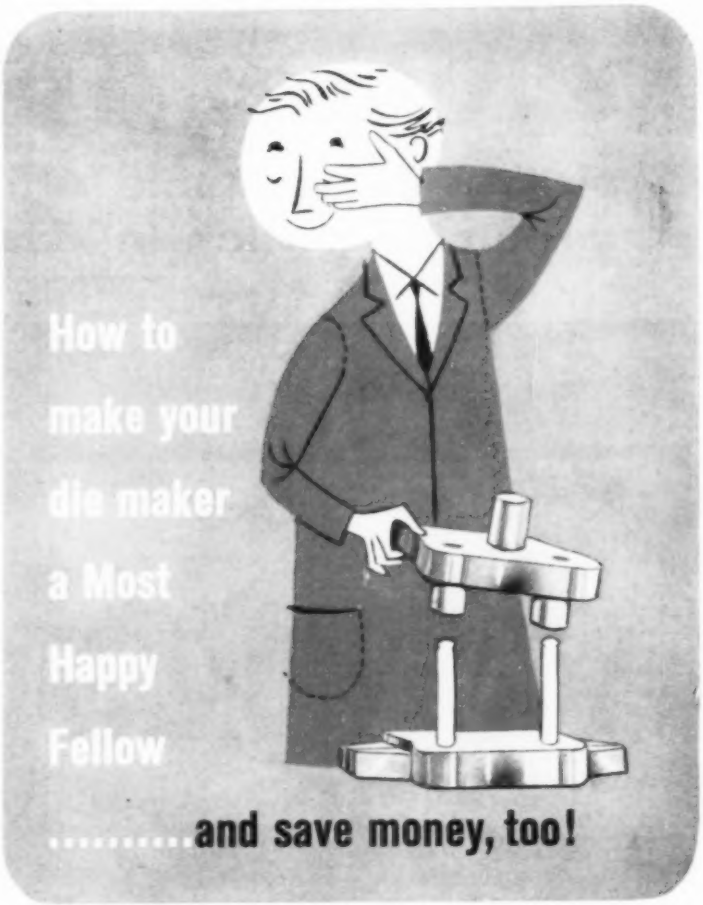
8. Select shank diameter for the press on which die will be run.

9. Choose grade of precision required—Master or Commercial—based on tolerances and number of pieces to be produced.

10. Order die set which meets most closely the above requirements, making certain that *all* ordering information is included: Catalog number and quantity; Master (Precision) or Commercial grade; length of guide pin; type of bushing; diameter of shank or "no shank"; how to ship. Keep in mind that special thicknesses of punch holder and die holder can also be ordered if required.

Of course, you may not find it possible to check these points in the exact sequence presented. However, if you will make it a habit to use this check-list for each die set you need, you can avoid making costly errors in ordering.

*"L" dimensions pertaining to pin length as shown in die set catalogs refer to distance from bottom of die holder to top of pins. They do not necessarily apply to actual guide pin lengths.



It's easy. Just be sure to specify Producto die sets with *Qwik-Fit guide pins.*

Then your die maker will always be able to assemble and disassemble his die sets practically blindfolded! No longer will he have to line up pins and bushings cautiously...tediously hammer die sets together...or pry them apart. With Qwik-Fit guide pins, the die set almost *puts itself together.* The spherical-angular radius on these pins prevents jamming or cocking *regardless of how the punch holder is started on.*

Think of the time your die maker will save...and the money *you* will save. Dies are growing more complex daily and that means assembly and disassembly of the die set dozens of times. In plants all over the country, Producto's Qwik-Fit pins are saving up to 75% of the time formerly required for these operations.

To improve morale and increase productivity, join the growing ranks of die manufacturers and users who specify "Producto die sets with Qwik-Fit guide pins." They are available on Master die sets at no extra cost.

HOW TO MAKE ORDERING EASIER:

Get your free copy of Producto's Die Set Catalog No. 11, designed specifically to simplify your selection and ordering job. And ask to receive the idea-filled Die Set Digest, too.

THE PRODUCTO MACHINE COMPANY
975 Housatonic Avenue, Bridgeport 1, Connecticut

Wherever die sets are used
PRODUCTO
PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

that end and I'll take this one," was the arrangement. After prolonged wrestling, the grand still stuck fast. During a rest, the owner dejectedly remarked "I don't think we'll get it out till we take the door off." The stranger replied "Do you want it out? Why didn't you say? I've been helping you put it in."

In large plants, with their multiplicity of written instructions and their heavy load of specialists, there must always be someone to interpret the instructions to the men in shop language, to keep the specialists with their feet firmly planted on the shop floor and their eyes directed towards the dispatch exit. That someone is the shop foreman. It is very much in his favor if he is an oldtimer, well versed in the manual skills. In many large works, however, such skill passes unnoticed. Hand work, as it is called in the shops, is frowned on; it's out of date. Fits must come from the machine tools, hand tools are now becoming museum pieces in specialized work. Assembly is now the only manual work permitted and that is threatened by automation.

Can a good mechanic handle a mechanical department or can an unskilled administrator do it? In general engineering shops where all classes of work are undertaken, a good mechanic with organizing ability and knowing the secret of getting on with men, should make a job of running a mechanical department. In that kind of job he would find wide scope for his skilled training and experience. He would stand a much better chance than would an unskilled administrator who, however clever, would be at the mercy of the men, or an assistant, in all things pertaining to skill. The only hope for the unskilled foreman is a good skilled assistant. The fly in the ointment for the boss is that he

"We don't mind employing the handicapped, Newborne . . . but not when their handicap is laziness!"

rugged cutting

...WITH LENOX MO-SPEED® POWER HACK SAW BLADES

Here is a power hack saw blade that can take it! Power-packed steel, tough-wearing teeth, and straight-cutting performance gives you increased production rates with minute tolerances.

Made of the finest high-speed steel, the LENOX Mo-Speed bites into the toughest materials, takes full-rounded chips, eats through hard spots. You'll spend less time changing blades, get straighter cuts, and boost cutting records when you switch to Mo-Speed.

There are three types of LENOX power blades designed to fit your particular cutting needs. Call or write today for full information.

LENOX
THE TOOLS IN THE PLAID BOX

AMERICAN SAW & MFG. COMPANY
SPRINGFIELD, MASSACHUSETTS • U. S. A.

would be in his assistant's pocket. Not a comfortable position for the boss.

Many bosses are in that position, and some of them make a success of sorts of it, but they are not really bosses; actually they are the bossed. If the skilled assistant is well paid for the job, they are quits, but a boss will naturally feel more satisfied with his job if he "knows it all" and can hold the reins firmly. We read and hear much today about job satisfaction. It means, or should mean, as much to the boss as to the men.

I've a friend who inherited a medium-size boiler repair shop. He has no mechanical training or aptitude. His foreman is weak and the men run the show; only present-day overfull employment keeps him in business. He makes a fair living, although there's a fortune in the connection if skilfully handled. He is the least happy employer I know.

I Y Parkinson
Rushden, England

THE EXECUTIVES of a company direct the organization and plot its course. They are the policymakers of the company and determine the offensive and defensive actions to be taken in the competitive business world. In contradistinction to this position the foreman is primarily a director of men. He is a policymaker to a very limited extent and mainly a representative of management in the shop. The position of foreman is a difficult one to define and the duties and responsibilities vary considerably from company to company. It is not uncommon to find variations between departments within a company.

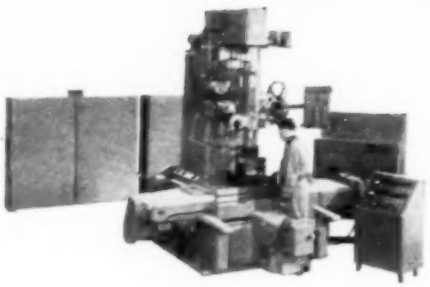
An executive is primarily a business man. Executive ability means deciding quickly and getting someone else to do the work. The executive's training and experience are generally in the fields of accounting, taxation, and administration. He may also possess mechanical training and technical know-how. The administrator who lacks the know-how of his particular industry or business is working under a handicap and must frequently seek information and assistance from his subordinates.

When an administrator lacking in technical knowledge of the work processes is placed in charge of a department it is difficult for him to do a good job. It is very easy for the men working under him to detect this shortcoming and, once detected, they are sure to take advantage of it. They will hit him with all kinds of technical problems even when they know the answers, just for the pleasure of seeing him squirm. His every answer will be "See me later," or "I will tell you tomorrow." In the interim he will run off to another department to get help and advice from a friend on his own level. He cannot go to his superiors for help, at least not very often. Going to men on lower levels may uncover the answer but it will only aggravate conditions. He may be confident in his ability as an administrator and attempt to solve the problems himself with the aid of handbooks. This method could prove to be disastrous for he could easily overlook some important related factor.

Such an administrator would experience difficulty in maintaining the usual level of production. The men could find an endless array of reasons and excuses for the drop in production. For example, the parts don't fit the fixture, the machines are worn out, or they need a new tool or gage. If he falls for this they will have him requisitioning all sorts of new equipment.

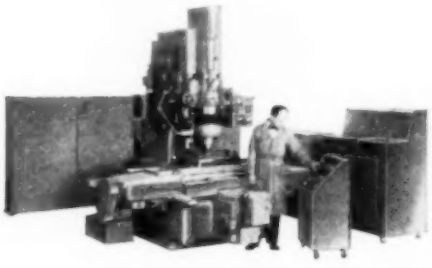
In contrast to this is the foreman with mechanical ability and technical know-how. This man commands the respect of the group he supervises because he knows the machines and equipment and can handle them. The men seldom try any tricks or come up with phony excuses for they know he has the ability to find them out. When it comes to measuring the day's output the mechanically trained foreman knows pretty

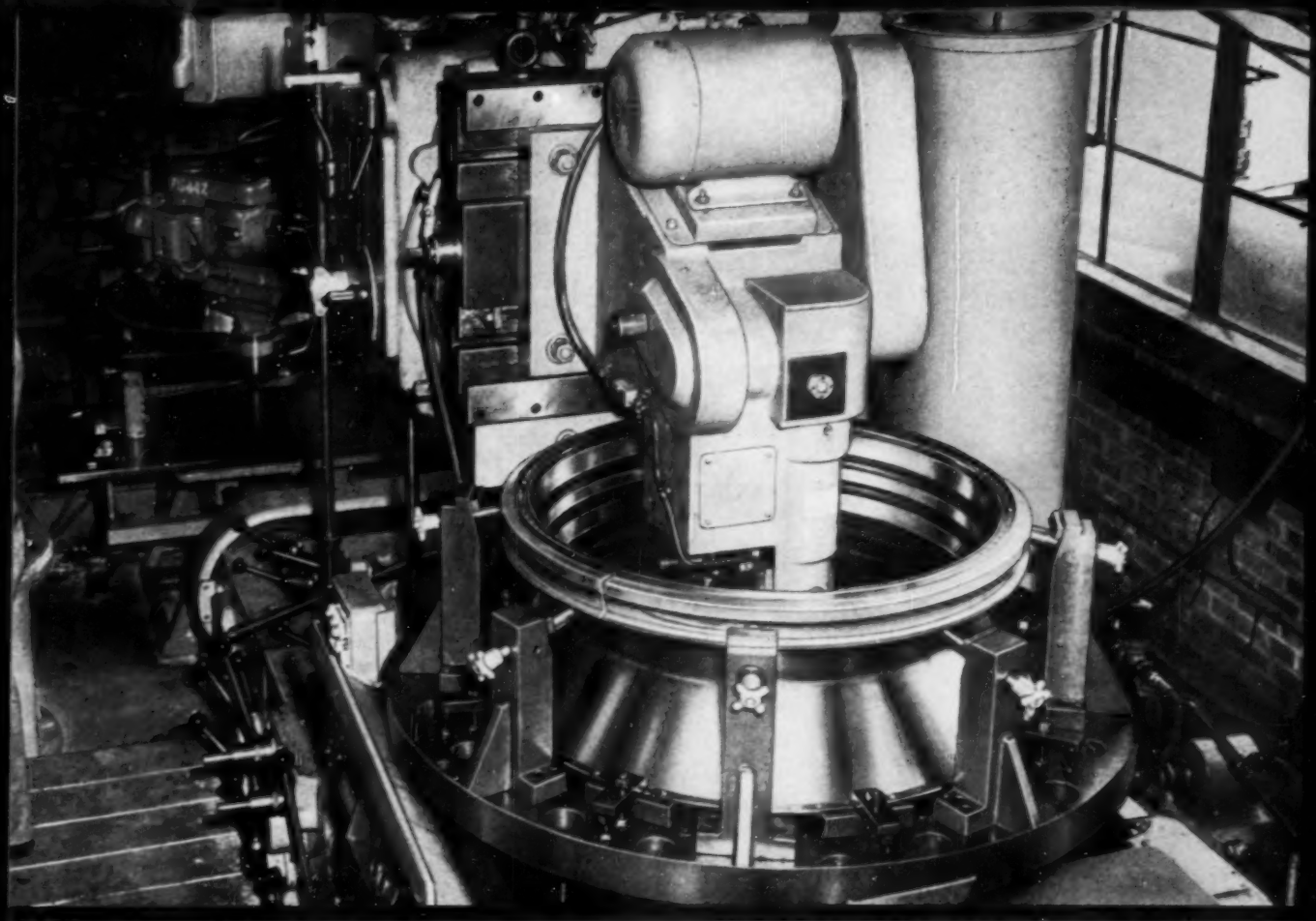
"Please, are you sure you can't call me down to the plant today?"



OTHER P&W NUMERICALLY CONTROLLED MACHINE TOOLS

. . . include the Electrolimit Jig Borer and the Vertical Precision Hole Grinder.





NO MISTAKES with NUMERICAL CONTROL

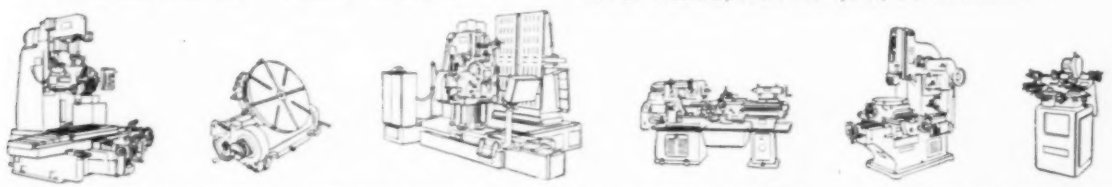
. . . and Machine Time Cut 46%!

These were the results when a Pratt & Whitney Numerically Controlled Rotary Table was put to work by Lycoming Division of AVCO Manufacturing Corporation. This job involves milling 236 slots accurately located on three rings within jet engine cases. Directed by a punched tape, the new table automatically indexes the work for each cut. Indexing is accurate to 5 seconds of arc. In addition, the table's numerical control system governs the milling feed motions . . . putting the entire operation on an automatic cycle.

Replacing a hand-indexing rotary table, the P&W Numerically Controlled Rotary Table has cut machining time 46%! Equally important, P&W Numerical Control eliminates operator error in locating the 236 slots . . . which would turn a nearly completed workpiece into scrap.

Lycoming's experience is no isolated example. Applied to P&W Rotary Tables, Jig Borers and other machines, Pratt & Whitney Numerical Control is producing equally spectacular time-and-money savings in many other plants. It may well offer opportunities for greater profits in *your* plant.

Write now for complete information. Pratt & Whitney Company, Incorporated, 11 Charter Oak Boulevard, West Hartford, Connecticut.



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MACHINE TOOLS • GAGES • CUTTING TOOLS

Because precision is always important, only the finest is good enough!

Whether you're working to tolerances of several thousandths or holding dimensions within a single "tenth", effective quality control and profitable operation demand that *all* work be measured against dependably accurate standards. That's why, where precision is concerned, you can't afford less than the best, regardless of price.

Easiest way to be sure of the best is to select Pratt & Whitney Gages. From start to finish . . . from the use of only the finest gage steels to the final lapping process . . . Pratt & Whitney gives extra care and attention to every detail that can contribute to finer quality, greater precision and better wear resistance. As a result, P&W Gages *are* accurate . . . *stay* accurate longer. Write now for complete information. Pratt & Whitney Company, Inc., 11 Charter Oak Blvd., West Hartford, Conn.

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well what a man should turn out. The foreman who has come up through the shop knows what tools and equipment can be used to advantage on a job and what would prove to be superfluous gadgets.

Keep the non-technical administrators in the office where they can work with and on paper. Leave the shop leadership to men who know machines and tools.

H Koslow
Bronx, NY

A FOREMAN'S JOB is not one that follows a precedent such as the right of eminent domain that the ancient kings fell heir to. In different companies, there are different jobs to be done. No two are alike but there must always be people to do the work, people to assign the work, and people to supervise. These people, in their varying degrees of responsibility, receive titles for the sake of convenience. A title is an arbitrary nomenclature that makes it easy to distinguish one member of the personnel body from another.

In actuality, however, the duties that are associated with the title depend on the wishes of the company management. If a company creates work for people, it is entitled to direct the type of work that this is going to be. When a man accepts a position in a shop he doesn't do it based on the simple statement that he is going to be an engineer, a draftsman, a machine operator, or a foreman, as concerns the case in discussion. The prospective applicant is told the nature of the work that he may undertake and frequently he is brought to the scene of the activity and given a rundown on the details of the assignment. Unless he

"Johnson, I'd like a word with you about your method of getting the work out."

is irresponsible, or an extreme introvert, he himself will put forth questions that haven't been answered in the job analysis that was given to him in the introduction. If he is wise, the man who is about to step into a new position will clarify any uncertainties as to where he stands in the department and what functions are his main concern.

We should know our business before we attempt to carry it out. This is the proper way to begin a job, and work well begun is half done.

C McLaughlin
Rockaway Beach, NY

PUBLIC PAYROLL

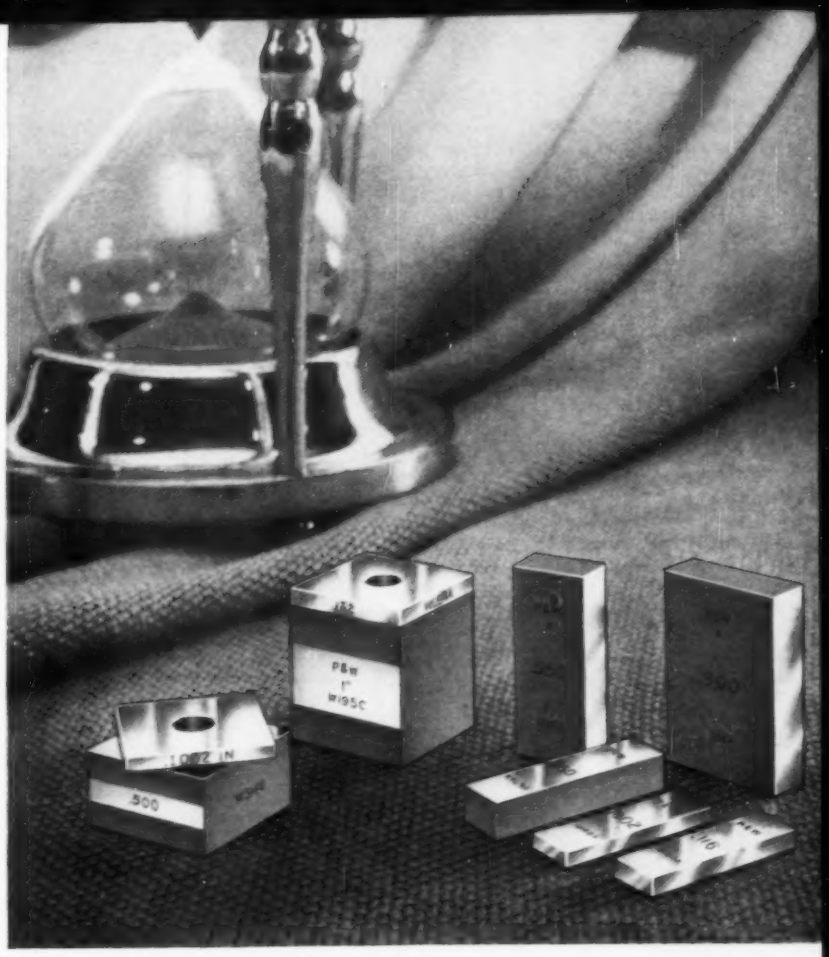
Would the posting of rates of pay on the bulletin board tend to quash demands for raises from those who feel they are underpaid? Or would it stir up increased dissatisfaction?

IT HAS BEEN my experience over long years of contact with shops and shopmen, that, whether we make payrolls public or not, makes little difference. They soon become public anyhow.

I've seen many attempts at keeping special bonuses secret, and never knew one to succeed. During World War 1 one of my good friends tried slipping an extra good workman a bonus (as much as fifty dollars at times, and fifty dollars meant a lot more in 1918 than it does now) with strict warning not to tell a soul. It didn't work.

There are few men who are singled out as being outstanding in any way who can bottle the secret up for very long. How can he keep it from his wife, who is entitled to know about the state of the family exchequer? He also wants her to know what a prize package she latched on to when she said "I do." She usually finds out anyhow sooner or later whether hubby talks in his sleep or not. And how can she refrain from mentioning, or at least hinting at it, when that stuck-up Mrs Highhat tells about what a wonderful guy *her* hubby is?

Even back in the days when each man was supposed to bargain separately with the boss (who usually boasted that he paid every man what he was worth, but in reality paid as little as possible) some men got more than others for the same work. And a quarter a day in those days meant more than it does now. With today's standards of wages there are probably fewer "extra dol-



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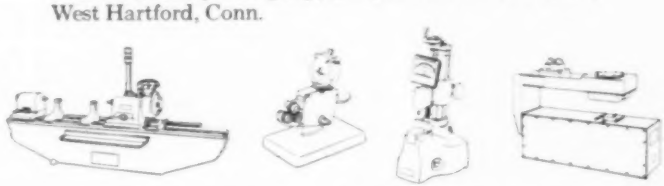
STAY ACCURATE!

Accurate to millionths for size, flatness and parallelism, Pratt & Whitney HOKE® and USA Precision Gage Blocks meet *or exceed* every Bureau of Standards requirement. They stay accurate longer, because they're harder. First in the field, *only* P&W produces the HOKE® Block . . . the *original* square block with the hole through the center for easy assembly with tie rods.

Broad or extremely close tolerances, whatever your work requires, effective quality control and efficient production *always* demand comparison against an accurate fixed standard. That's why your choice should be Pratt & Whitney Precision Gage Blocks for permanent precision you can count on. Write for complete information. Pratt & Whitney Company, Inc., 11 Charter Oak Blvd., West Hartford, Conn.



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lars" (we don't bother to mention quarters now) passed under the table. Even if the practice still exists, human nature has not changed materially—wives still have to be told in most cases—and they still like to boast about the ability of their men. If they don't, things at home are not going as well as they should.

One of the best examples of shop publicity I can recall was practiced years ago in the White Motor Co in Cleveland when E E Hewlett was the guiding spirit. A large bulletin board at one end of the shop kept the men posted on many things. One notice I recall was about a new planer they had just installed. It told how much the planer cost and how much work it would have to turn out to pay for itself. It gave the earnings of the company each year and where the money went. It kept the men posted on new orders, where some of the work went, especially in foreign countries, what it was doing, and other details—human interest stuff that pleased the men.

Perhaps the best effect of this shop policy was when a couple of strike agitators tried to stir up trouble. The chief of police called Hewlett one morning and told him that they were in town. Told him not to worry, that his men would pick them up when they began to talk. Hewlett's reply was typical.

"Don't pick them up. They have a perfect right to talk. And I want to hear what they have to say to our men. Then I may have something to say also."

The agitators spoke in their most approved fashion. Hewlett also spoke. The men went back to work and nothing happened.

One other example of Hewlett's public policy ought to be told also. During the first war they had a relaxation period for the male office workers. All were obliged to attend exercises in the gymnasium. Every man stripped to his B V D's in the gymnasium. I asked him why. His answer was typical.

"Not even a V P can high-hat the office in his B V D's."

Fred H Colvin
Point Pleasant, NJ

"I've worked with him for 15 years and he's never had a good day!"

WHEN A SHOP supervisor is plagued by an excessive number of requests for wage increases it is an indication of a poor wage policy. Posting the wage rates on the bulletin board will not correct the problem for a number of reasons. It is a radical approach to the dilemma, but an analysis of the over-all picture will readily prove the folly of such a move. Such a notice will not tell the employees very much that they do not already know.

The general policy in industry is to treat wage rates as confidential information. This does not mean that it is a top secret known to only one or two executives. It is not openly advertised but it is definitely not a secret in the full sense of the word. Even in the small plant this information is known at least to a few people. In addition to the foreman and supervisors, the payroll clerks and the personnel department have access to this data. Over and above this there is the employee himself who may inadvertently let this information slip out, or who may brag or complain about his lot. There is yet another path, for this information may get back to the shop via the back door. The employee's wife and family know the pay rate and they are not infallible.

The company's policy of maintaining a pseudo-secrecy regarding this data does serve some small purpose. Since employees are not supposed to have this information they may hesitate to use it as a point of argument in their wage demands. Making wage rates public knowledge would eliminate this point of restraint and employees will base their case for a raise on the published list.

It is a common human trait to overrate one's ability and value to the company. This probably stems from the fact that we are inclined to judge ourselves on the basis of what we could do and what we hope to do rather than on what we actually do. Invariably the actual, which is

Let me show you*

**James C. Browning, P&J Representative in the Ohio area.*

how changing to a P&J Automatic helped DeVilbiss . . .

JOB FACTS:

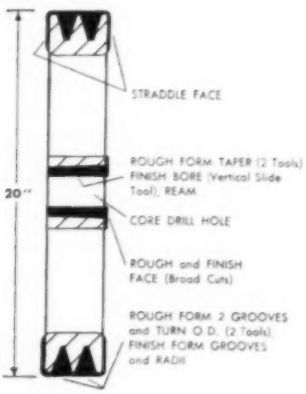
PART: *Air Compressor Flywheel*

MATERIAL: *Cast Iron*

REQUIRED: *5 turning, boring, facing, grooving and reaming operations*

THE MACHINE: *A P&J 6DRE-40 Automatic Turret Lathe*

THE RESULTS: *22 pieces completed every 4-hour shift . . . with the operator also handling 2 other secondary operations*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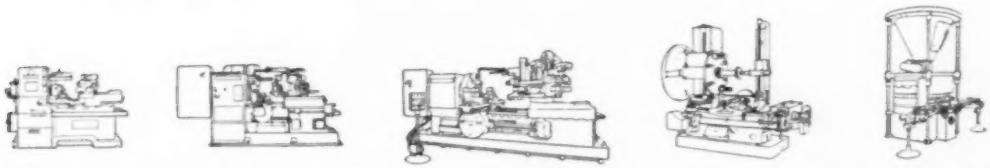
ROUGH FORM 2 GROOVES and TURN O.D. (2 Tools)
FINISH FORM GROOVES and RADII

. . . SAVE 66% IN LABOR COSTS through "JOB INTEGRATION"

The Potter & Johnston 6DRE-40 Automatic Turret Lathe recently installed at the Toledo, Ohio plant of the DeVilbiss Company machines large, high-precision flywheels – handling 5 complex cuts on a fully automatic basis. Previously, using a hand-type lathe, this same job required 5 separate hand operations and the operator's full-time attention. Now, with the P&J *Automatic* on the job, the operator also handles two secondary operations . . . keyway broaching and balancing . . . that formerly required 2 additional operators working in separate departments. As a result of this new "job integration," labor costs have been reduced 66% with 2 men released for other work, overall time for flywheel production has been reduced 20 to 30%, and costly time-wasting intra-plant handling has been eliminated.

If your manufacturing operations demand high-speed, economical production of precision parts, a switch to P&J Automatics can help reduce machining time and costs . . . and may also make it possible to streamline a whole series of related operations. Act today. Let us send the P&J Representative in your area to analyze your requirements and recommend a production plan to meet your needs. Write direct to Potter & Johnston Company, Pawtucket, Rhode Island.



AUTOMATIC TURRET LATHES . . . GEAR CUTTERS . . . PACKAGING MACHINES

POTTER & JOHNSTON

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INC.

PRECISION PRODUCTION TOOLING SINCE 1898

with the **LIPE Automatic MAGAZINE LOADING BAR FEED"**

says Screw Machine Foreman Willis J. Forbes*

Up to six months ago, the record per-machine production in our department for a single day was 5760 pieces. Our best monthly average was 5300 pieces per day. We tried out a Lipe A.M.L. to feed one machine, turning at the same cutting speed as before. In the first full day of operation, the A.M.L.-fed machine matched our top monthly average by 1:25 P.M. . . . and ended the day at 4:00 P.M. with a production of 7823 pieces! It has continued to turn out that number daily, *for six months!*

Why? The Lipe A.M.L. feeds stock continuously: No repeat motion for feed-outs. No down-time for changing feed fingers, or for remnant disposal. No cutting air — and when you stop cutting air, you start cutting costs. That's why we are now equipping our department throughout with Lipe A.M.L. Bar Feeds.

WRITE OR WIRE for a FREE Lipe Sales Engineering estimate of production increases, savings and amortization time of Lipe A.M.L. Bar Feeds in your production layout.

*Photographer's models and pseudonyms used to protect company identity and confidential information.

Lipe-ROLLWAY CORPORATION SYRACUSE 1, N. Y.

MACHINE TOOLS • HEAVY-DUTY AUTOMOTIVE CLUTCHES • PORTABLE POWER HACK SAWS

limited by time and human inertia, is less than the imaginary. As a result most people feel sure they are worth more than they are getting. In some cases this resolves itself into an actual wage demand, but more usually it merely feeds that endless hope for an increase the next time raises are handed out.

If the wage rates of all the employees are posted on the bulletin board it serves as a constant reminder to the men of their relative position on the scale. It will be an ever-present, disturbing influence. Each employee will maintain a constant vigil, observing the work of the others and telling himself that he is doing more and better work than they are, and should be rated ahead of them. The men can never be rated to the satisfaction of all, so why present this list as a constant reminder of their dissatisfaction?

There is another problem which may spring forth from the publication of such a list. Is there a man in the group who is overrated and overpaid? Such a condition may be the result of friendship or relationship to a person of influence in the company. There may be an employee who demonstrated a high degree of ability and effort and earned several raises only to ease up on his work so that he is now overpaid. Such a person would try to protect his secret and be extra careful about revealing his pay rate to the others. With the publication of the list all the employees are sure to compare themselves with this overpaid per-

"Why can't anybody around here just quit when they quit?"

This NEW Manual Starter has EVERYTHING!

NEMA Sizes 0 and 1

Two, three and four-pole construction

SMALLER! Takes less space, whether it's built into machine or mounted externally

SMART STYLING! Matches the streamlined appearance of today's modern machines

QWIK-MAKE, QWIK-BREAK! Positive snap-action opening and closing of contacts. Longer contact life

TRIP-FREE OVERLOAD PROTECTION! Impossible for operator to hold motor circuit closed against overload

LONGER LIFE! *Toggle Action* operating mechanism. Heavy-duty construction throughout

EASIER INSTALLATION! Wire it without removing starter from enclosure. All terminals have pressure wire connectors

EASIER MAINTENANCE!
"Off-the-Shelf" parts kits make normal maintenance and modifications easier than ever. They're easy to buy, easy to identify, and faster to install

TAMPER-PROOF!
Cover padlocking device prevents tampering by unauthorized personnel. Safety latch locks "start" button in "OFF" position

VISIBLE INDICATION OF OVERLOAD!
Self-centering push-buttons show when overload has occurred

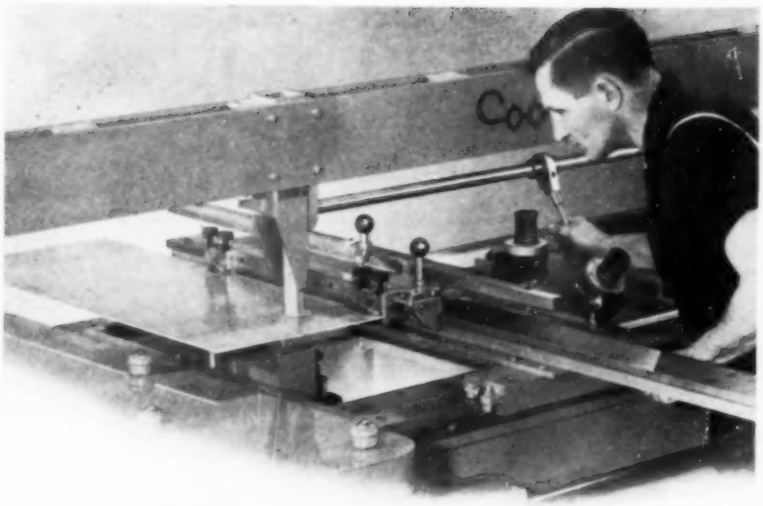
CHOICE OF ENCLOSURES:

Water and Dust-Tight
Hazardous Locations
Flush Mounting

Write **for BULLETIN 2510 B-C**
Address Square D Company,
4041 North Richards Street,
Milwaukee 12,
Wisconsin

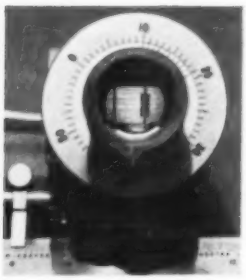
EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

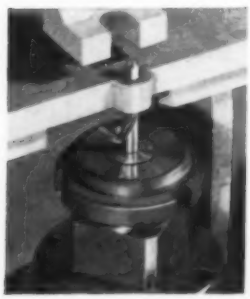


TEMPLATE MAKING

Made Easy



Dimensions are set to .0005-in. with optical scanner. Fine adjustment centers magnified scale graduation between reference marks for accurate locations.



Carbide bushing assures accurate drill orientation.

The **WIEDEMANN COORDINATOR** takes the high cost out of producing templates, drill jigs, simple fixtures and other precision work in flat sheet metal or plate. Holes are located and drilled to ±.002-in. with no accumulative error.

In rapid sequence, each hole is located to X and Y dimensions using optical scanners, and drilled from beneath the sheet through a carbide guide bushing.

With the new Wiedemann Coordinator, accurately drilled work is produced in a fraction of the time normally required. Time consuming manual layout is completely eliminated. Templates are produced on a machine specifically designed for template making—without interfering with work schedules on production equipment.

Get the facts about the

WIEDEMANN COORDINATOR

Write today for *Bulletin C.*

HICKS COORDINATOR DIVISION

WIEDEMANN MACHINE COMPANY

TURRET PUNCH PRESSES

4217 Wissahickon Ave. Philadelphia 32, Pa.

son and a storm of wage demands will ensue. Publication of a list of wage rates can do little if any good. The possibility for harm is great, so why do it?

William Martin
Brooklyn, NY

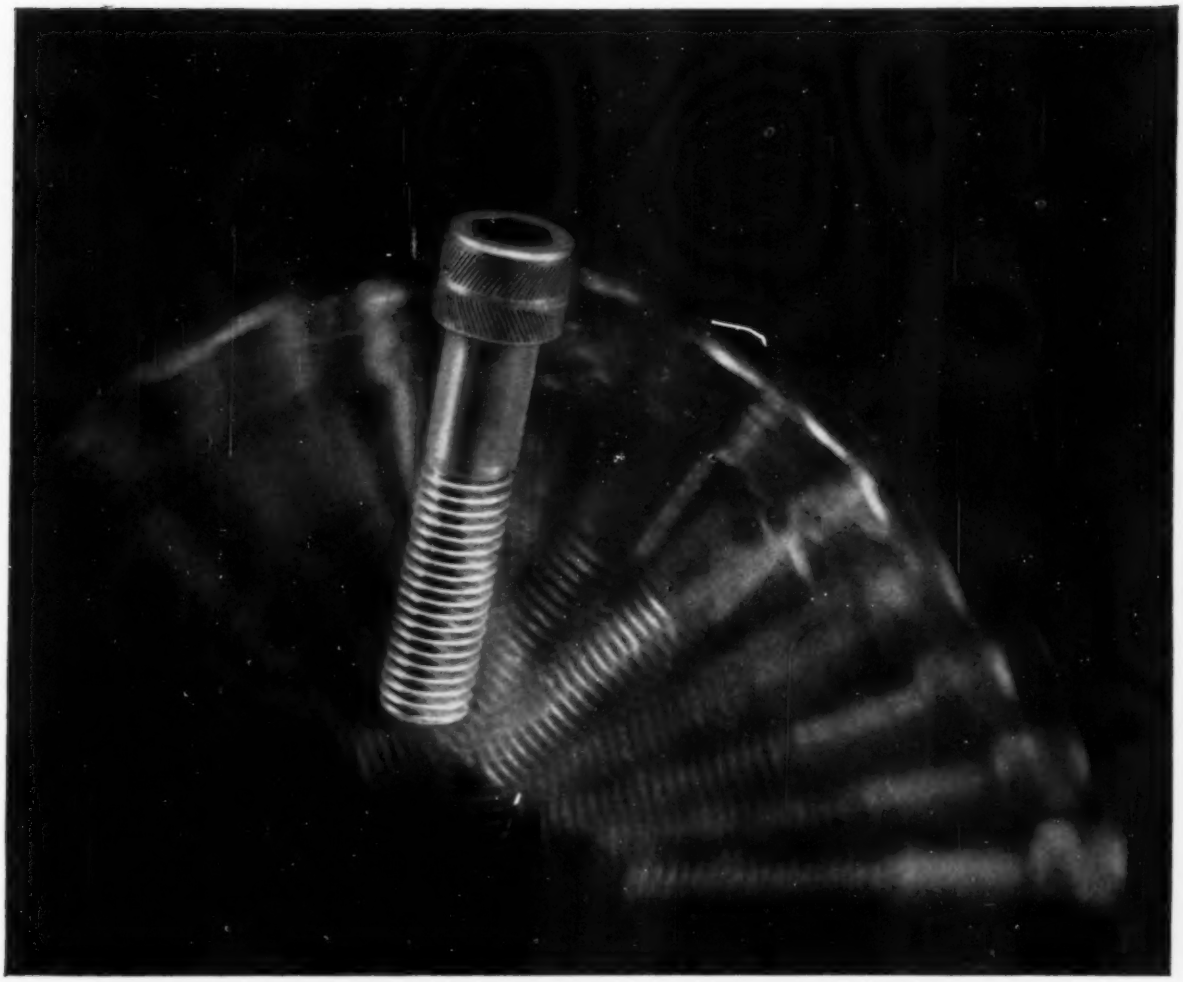
SCHOOL FOR NOVICES

Would a basic course in facts about the plant, the product made, and facilities for making it be of interest and value to the workers in the shop, or are shopmen generally disinterested in such information?

EDUCATION IS OUR most powerful tool and at the same time our most powerful weapon. The individual and the company that will grow and advance is the one willing to make the sacrifice demanded by the learning process. They must be willing to forego current income and leisure for future benefits. This is not a new principle or practice. It has always been an economic truth.

All capital equipment exists as a result of a willingness to wait. Man would still be pounding out his weapons and implements on convenient rocks except for the long-forgotten individual who was rash enough and patient enough to suspend his work while he built a bronze hammer and anvil. The early fisherman lost many fish and gave up much leisure while he built a boat so he would not be restricted to fishing from the beach.

The same principles apply at the present time. The man who works at the bench foregoes some pleasure to buy a book and some leisure activity in order to study it. He does this to increase his store of knowledge and in the hope of improving



There's a good reason why CHICAGO socket screws "roll with the punch"

Strange as it seems, the hardest fastener or one with greater tensile strength can be the weakest part of your product. Why? Because excessive hardness results in a brittle fastener that is more susceptible to failure under sudden shock.

At CHICAGO, *proper* hardness is a mighty important phase of our metallurgical quality control. Through years of specialized experience, we've found the hardness range that produces a fastener with just the *right* amount of elasticity to withstand severe shock and vibration. Constant testing assures *every* fastener has this hardness . . . one of many reasons CHICAGO screws are the most dependable you can buy.

For help on all your fastener problems, call your CHICAGO distributor. He's your direct line to 85 years of fastener experience.

THE CHICAGO SCREW COMPANY

ESTABLISHED 1872 • DIVISION OF STANDARD SCREW COMPANY
2701 WASHINGTON BOULEVARD, BELLWOOD, ILLINOIS

It pays to standardize on CHICAGO FASTENERS

Smart way to buy stampings...

LOOK AT ALL THREE*

Our ability to use the *best of three* stamping techniques, each our own exclusive development, assures lowest possible cost on any quantity — one to a million or more.

1 **A FEW PIECES** —at Experimental or Pilot Stage

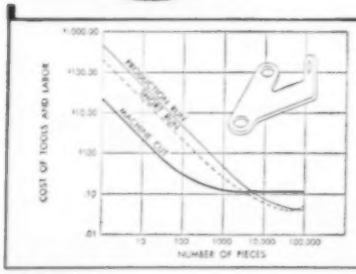
NO DIES! Our machine cut method, applying custom-built slitters, cutters, saws, files and stock punches—PLUS special techniques and skills—produce these small quantities at very low cost.

2 **SHORT RUNS**

TEMPORARY LOW-COST TOOLING! To produce something more than a few, but less than high production quantities, our simple contour dies—PLUS special purpose presses—keep costs low.

3 **PRODUCTION RUNS**

MODEST DIE CHARGES on larger quantities! Here is where our regular production toolings apply to advantage . . . to deliver high quantity Stampings, and at lowest possible unit cost.



May we quote on your next stampings job? No cost. No obligation.

*With apologies to a great auto maker and a great ad campaign of yesteryear.

LOOK *Free 12-page booklet shows how to save on stampings . . . write for it.*

STAMPINGS DIVISION

"One Piece or a Million"

3101 Union Street, Glenbrook, Conn.

LAMINATED SHIM COMPANY, INC.

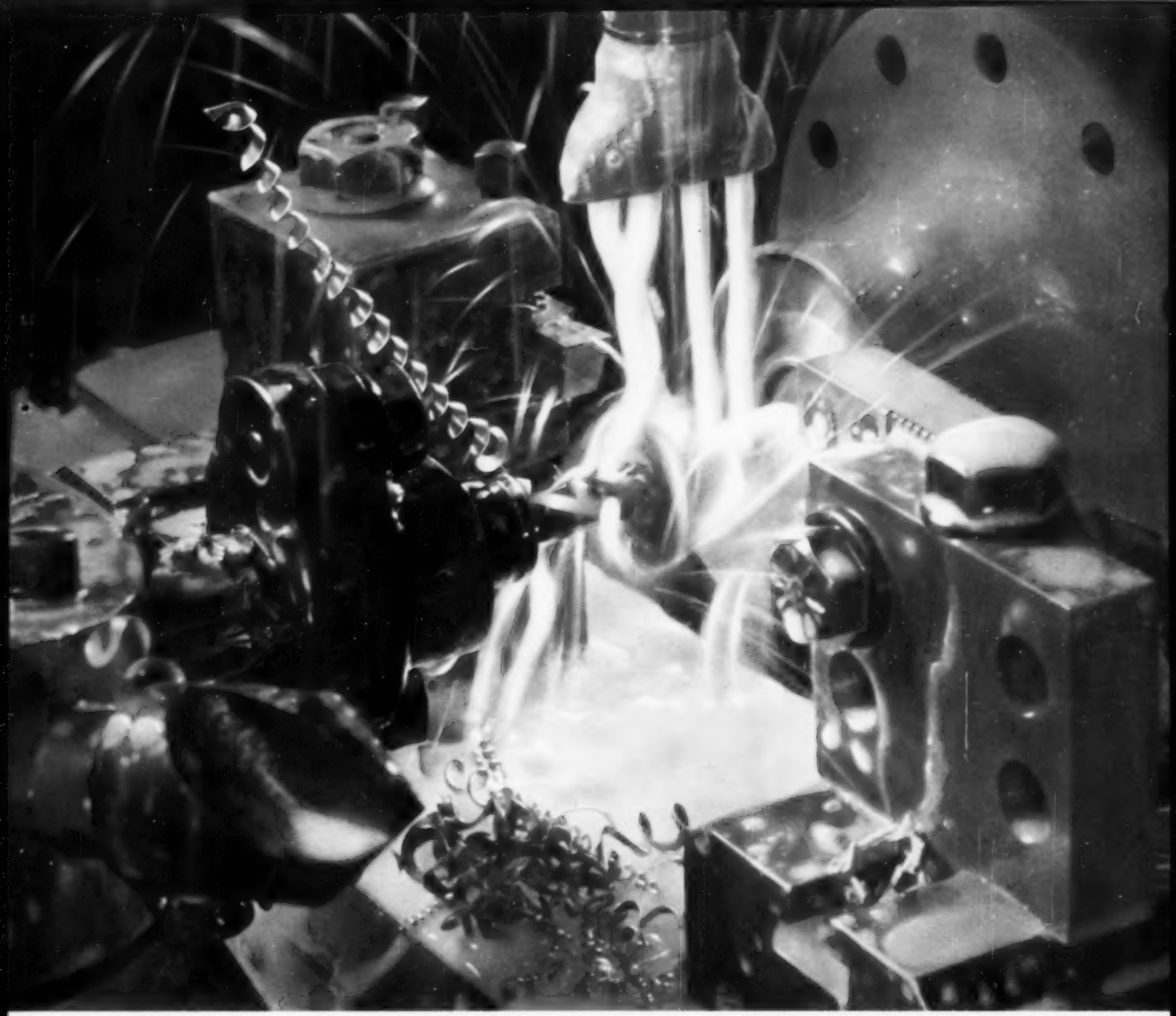
his future earning power. The machines in the shop occupy the same position as this book. The owners have spent their money on these machines instead of on pleasures because the machines will provide increased earnings in the future.

Education is a good investment; in fact, it is one of the best. The plant that offers courses of instruction to the employees is taking a gamble, but it is close to a sure thing.

When the company offers to pay for half of the time spent in the class they are being more than generous. The usual arrangement is for management to pay the tuition charges when their employees take courses at local schools and colleges. This plan is usually limited to courses approved by management. When this plan is employed it is frequently the younger men who take advantage of it. The men who have been out of school for many years are hesitant about attempting to return to formal education in the classroom. They are fearful of the embarrassment which may ensue from shortcomings in their vocabulary or speech.

This company's plan to conduct classes right in the plant and to pay the employees for half of the time they spend there has much merit. The men will not feel that they are going to a formal school, a place they remember in terms of raised hands and report cards. They will be glad to give it a try for they know they will not be strangers in a strange building, but rather among friends right in the plant. Once they get re-acquainted with the pleasures and satisfaction of learning they will

"Do you have to look so important when you're taking a break, Hickey?"



Pictured above is Johnson's J-Cool—a superior coolant for all-purpose use—one of the complete line of modern coolants.

For 50 years nothing important happens to coolants . . . now a major improvement!

Johnson's discovery—the use of waxes and wax-type synthetics in specially formulated metalworking fluids—*is the first major improvement in coolants since 1900.*

Use Johnson's for high-speed machining, grinding and forming. Results will convince you of their superior performance. You'll get increased production from your men and machines . . . the quality of work will show a definite improvement. In other words, Johnson's can help you reduce costs and increase profits on your production lines.

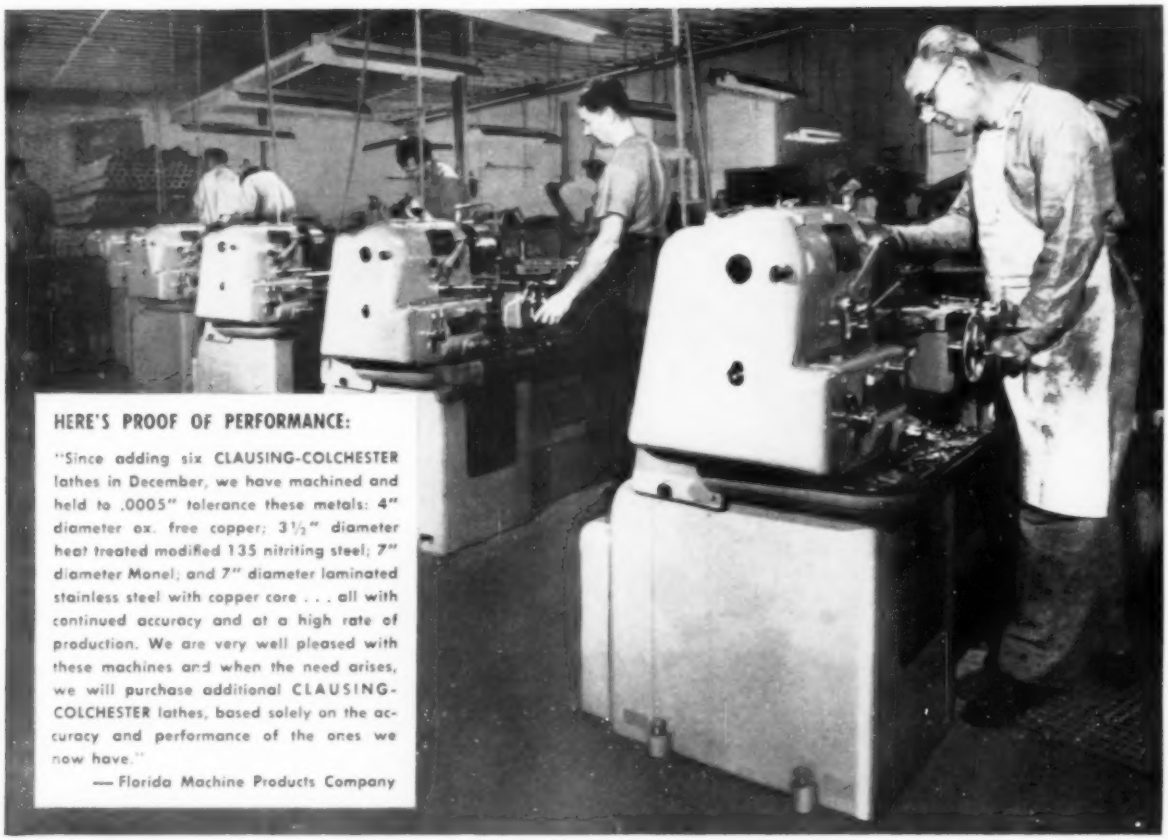
Your Johnson's industrial distributor will be glad to set up an in-your-shop test of J-Cool . . . or any of the complete line of Johnson's Metalworking Fluids. Ask about Johnson's money-back *Guarantee of Superior Performance* over ordinary coolants.

from Johnson's Wax

S. C. Johnson & Son, Inc., Industrial Products Dept., Racine, Wisconsin

3101 Union Street, Glenbrook, Conn.

you're taking a break, Hickey?"



HERE'S PROOF OF PERFORMANCE:

"Since adding six CLAUSING-COLCHESTER lathes in December, we have machined and held to .0005" tolerance these metals: 4" diameter ox. free copper; 3½" diameter heat treated modified 135 nitriting steel; 7" diameter Monel; and 7" diameter laminated stainless steel with copper core . . . all with continued accuracy and at a high rate of production. We are very well pleased with these machines and when the need arises, we will purchase additional CLAUSING-COLCHESTER lathes, based solely on the accuracy and performance of the ones we now have."

— Florida Machine Products Company

Performance records PROVE CLAUSING COLCHESTER LATHES'

Superior Construction . . . Greater Value

The statement of Florida Machine Products above is typical — users everywhere report Clausing geared-head lathes lead their field in capacity, performance and value. Here's why:

They're bigger in capacity than other lathes in their class. Larger spindles, larger thru-hole capacity, larger bearings for heavier work. (See chart at right.) Geared-head drive is powered by one or two speed motor thru multiple V-belts.

Have heavy-duty construction throughout. Beds are 50% steel, 50% iron with elliptical cross ribbing — ways are induction hardened and precision ground. Gears in head and quick-change box run in bath of oil — gear shafts are multi-splined. Power feeds are taken from separate feed rod, lead screw is used for thread cutting only. Spindles are high-tensile hammered steel forgings — note size. Note, too, the heavy-duty construction of tailstock and double-walled apron.

Built for precision performance — to American standards of toolroom lathe accuracy. Gamet Micron tapered roller bearings with oil flow lubrication — the most advanced and accurate bearings known to industry. And each Clausing lathe passes rigid tolerance tests before it leaves the factory.

Each is an outstanding value. 13" cabinet base models, including motor and controls, start at $2113; 15" cabinet base at $2988; 17" at $4715. You owe it to yourself to investigate before investing in *any* lathe.

LATHE CAPACITIES

17" lathe: 54" and 78" centers, 28" swing in gap; 15" lathe: 30" and 48" centers, 24" swing in gap; 13" lathe: 24" and 36" centers, 18" swing in gap.

SPINDLE CAPACITIES

Lathe	17"	15"	13"
Thru-Hole	3-1/16"	2-1/16"	1-9/16"
Nose Taper Key Drive	L-2	L-1	L-0

BEARINGS

Lathe	17"	15"	13"
Front Spindle Bearing O.D.	7-1/2"	5-1/2"	4"
Rear Spindle Bearing O.D.	6"	4-3/8"	3-9/16"

CLAUSING DIVISION *Write for Free Literature*

ATLAS PRESS COMPANY

1-101 N. PITCHER ST. • KALAMAZOO, MICHIGAN

be on their way. If they have ability, this course will renew their ambition and they can continue on their own.

These courses are an excellent idea and more companies should adopt this plan.

H Koslow
Bronx, NY

A COURSE GIVEN to answer workers' questions about the plant they work in can be of great value to the workers and the company, provided the speaker works with a light hand. Suitable speakers for that work do not grow on gooseberry bushes. They are extraordinarily difficult to find. The trouble is to find a speaker with the right touch. One who can keep the talks simple, interesting, and instructive, without giving his hearers the feeling that he regards them as so many dull children. The successful speaker for those talks is he who can make "chicken feed" sound important and interesting.

It can be a nightmare job for the speaker if the ages of the listeners range from sixteen to sixty. From time to time I have had to arrange similar talks and have had to take my share of the talking. I find it most convenient to do this by age groups, sixteen to twenty, twenty-one to thirty, thirty-one to forty-five, above forty-five. I also regard it an advantage to have youngish speakers for the youngest listeners. I think Ed is unduly pessimistic and I disagree with him that the men would be the stumbling block.

My experience is that the instructors are the snag; getting the right one is a full-time job. By all means encourage the enquiring minds in the shops; it is money well spent and I don't think it wise to encroach on the men's time in this matter. I am satisfied it should all be done on company time. That is a departure from my normal attitude to something for nothing. I don't believe in coaxing and mothering, but I do feel this venture should be an offer without strings. In piecework shops, having the talks on company time is meeting the men half way. The company loses an hour's production, the men lose an hour's piecework by being paid for an hour at time rate. Even on those favorable terms, with a cup of tea and a few cigarettes thrown in, my experience is that only about sixty per cent of the men participate. That percentage is regarded here as well worth while.

In these days of scientific advance

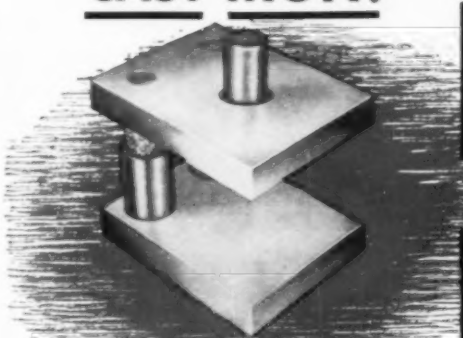
now!

YOU CAN HAVE THE BEST FOR LESS . . .

LEMPCO STYLE "M" and "L" DIE SETS

NEW

ALL-STEEL
DIE SETS AT THE PRICE OF
CAST IRON!



BALL-BEARING ANTI-FRICTION PIN BUSHINGS

EASIEST AND FASTEST TO ASSEMBLE OR DISASSEMBLE

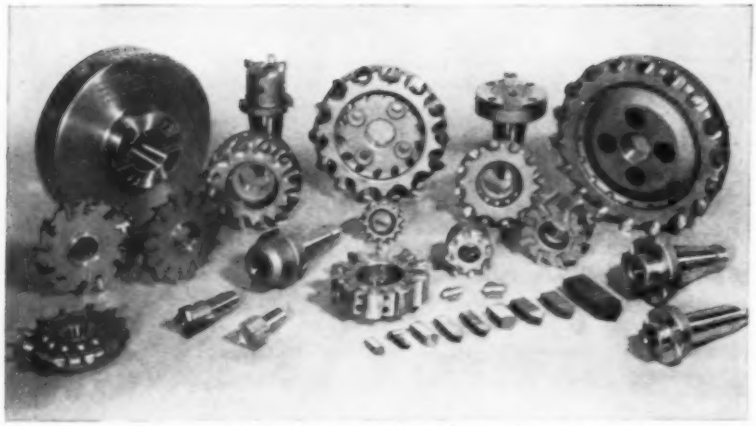
PRECISE ALIGNMENT FOR MILLIONS OF STROKES

ZERO MAINTENANCE; ONLY CUP GREASE AT GRINDING TIME

NOW, Lempco's line of Precision Ball-Bearing Die Sets, includes new low-priced *all-steel* sets, Style "M" and "L", at the price level of *friction-type cast iron* die sets. Better write TODAY for New Low Prices!

LEMPCO
INDUSTRIAL, INC.
DUNHAM RD., BEDFORD, OHIO

WHERE QUALITY CONTROLS!



Milling Cutters — End Mills — Blades — Boring Tools — Arbors — Flywheels

These Lovejoy Products can help you Cut Costs!

The entire line of Lovejoy Milling Cutters and Accessories is designed to aid you in getting better production at less cost.

If you are not now using Lovejoy products, we invite you to do so at first opportunity.

Lovejoy precision-engineered tools include:

Inserted-tooth milling cutters (face, side, end, slotting and boring) which feature husky, forged steel housings; exclusive Lovejoy "positive-locking" blade assembly; a variety of dozens of models and hundreds of sizes.

Blades: H.S.S., Vasco Supreme and carbide. These are interchangeable over a wide range of housing sizes, and Type "A" face milling cutters will fit any standard Lovejoy Type "A" cutter of 4½" to 24" dia. All Lovejoy blades are carried in stock, ready for immediate shipment. Special cutters are a Lovejoy specialty.

NEW

Lovejoy announces the "SHEARJOY", a completely new line of inserted-tooth face mills whose shearing action removes metal at record rates. H.S.S., and Vasco Supreme blades are available.

"Operator reports . . . best milling cutter he ever used on steel." "Prospect buys *Shearjoy* on the spot, after demonstration." "Customer reports 4½" feed at 52 RPM on tough die steel." "Used for 3 shifts without resharpening and without coolant."

Catalogs — include: "Face Mill Catalog No. 31; Side Mill Catalog No. 32; Type "S" Bulletin; Arbor Catalog No. 33; "Speed and Feed" Calculator. Write today for copies desired.

LOVEJOY TOOL COMPANY, INC.
Springfield, Vermont, U.S.A.

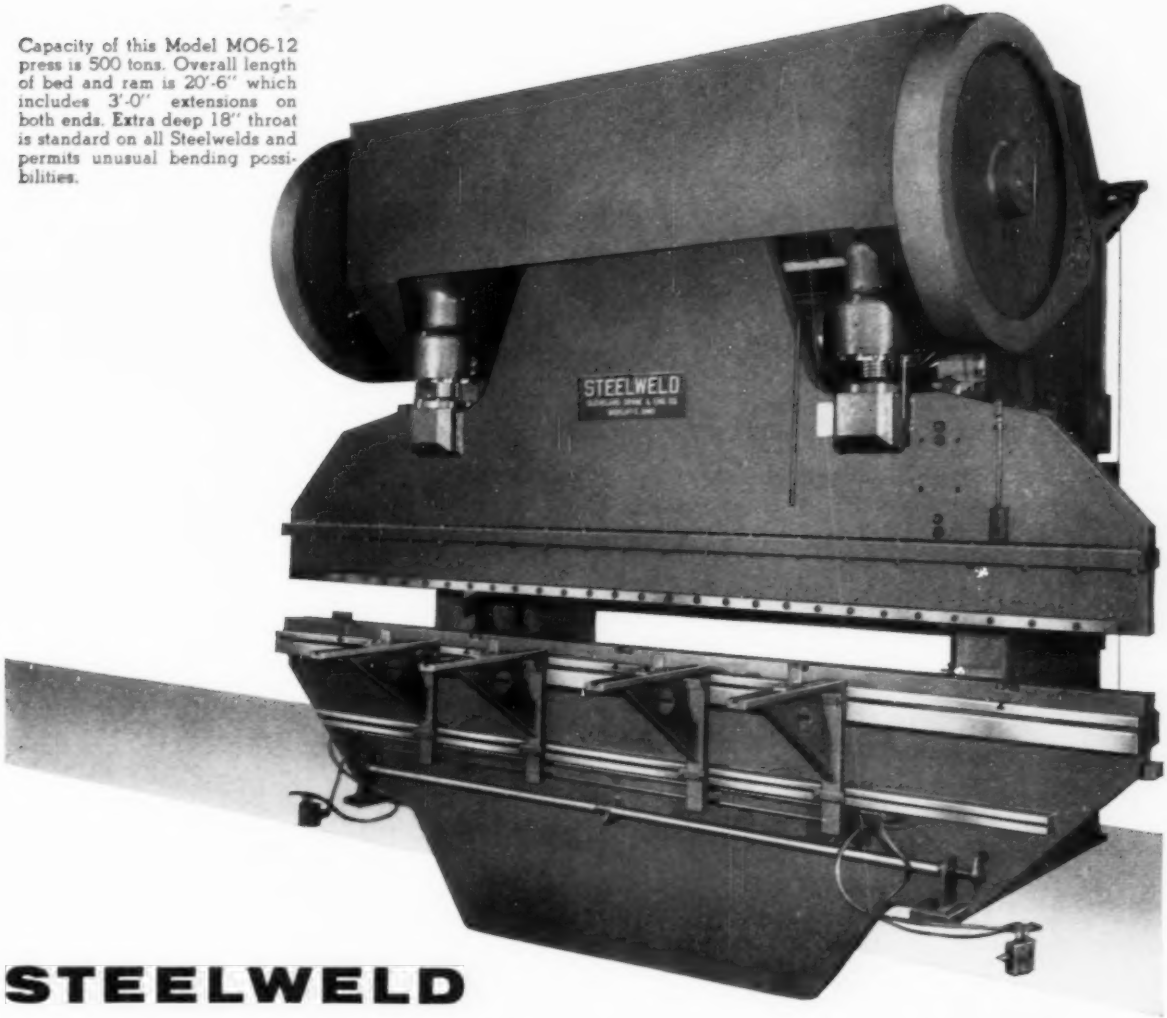
and productive expansion when brains must be trained and wits sharpened, when the men at the tools have to assimilate unfamiliar names and terms, it is imperative that the net be cast as widely as possible. Not only can companies spend the time and instructional effort, progressive firms cannot afford not to. There are compelling reasons for doing so, the compulsiveness of automation calling for a higher standard of intelligence, atomic engineering production with all its new and bewildering technique and terms. Those two new industrial revolutions running concurrently are a heavy sentence on the men on the shop floor, the majority of whom have paid scant attention to further education since leaving school.

The need for a basic engineering course or courses is urgent, a first priority on industry if the West is to maintain its scientific and industrial superiority over the East. Time is not on our side in this matter, we haven't a moment that we can afford to waste. If we drop back into second place—it could happen, it has happened to others before—then goodbye to all our hard-won superiority and our much envied standard of living. Those are some of my reasons for suggesting that the courses be made as attractive as humanly possible. Half measures won't keep us in the industrial forefront; we must go the whole hog. It's a matter of survival, it's sink or swim.

In this present early stage of further education, industry must make the cause its own. The schools referred to by Ed will take the matter further, but till they get into their stride, industry alone can save the situation, industry has no choice in this matter. Again I would emphasize, the success of the scheme will be roughly in proportion to the

"I just happened to be passing by and I noticed your factory."

Capacity of this Model MO6-12 press is 500 tons. Overall length of bed and ram is 20'-6" which includes 3'-0" extensions on both ends. Extra deep 18" throat is standard on all Steelwelds and permits unusual bending possibilities.



STEELWELD

PRESS BRAKE Designed For Special Gooseneck Punch and Standard Dies

THIS Steelweld Brake was designed to take a special gooseneck punch and, for this reason, has a shut height of 30 inches. However, it will also accommodate standard dies because the ram is provided with an extension, as shown, which brings the shut height down to 16 inches.

The bed has a slide rail on which is mounted four brackets, adjustable up and down and along the bed, for supporting materials going through the machine. The brackets have adjustable stops that enable gauging the width of metal being formed.

STEELWELD
PRESS BRAKES

Like all Steelweld Brakes, this press was designed to permit hairline accuracy. Under full load the average deflection will not exceed .001 inch per foot between housings. An important reason for this accuracy is the unusually rigid frame which was fabricated entirely of rolled steel plate and welded into a one-piece integral unit. Another is the extra deep bed which extends 2'-6" below the floor.

The machine has a 6-inch stroke with two speeds of 7 and 20 strokes per minute. The clutch is air-operated and controlled by two foot-operated valves. A reversing flywheel permits reversing the ram at any position of the stroke.

The Steelweld Brake design is readily adaptable to suit special requirements. Our engineers will be glad to work with you on press brake and heavy stamping problems.

Write for free copy of Catalog No. 2010

STEELWELD DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. 1467 E. 281 ST. • WICKLIFFE, OHIO

"TWO PRESSES IN ONE"

REPORTS STEWART-WARNER CORP., CHICAGO, ILL.

Die Cushion is automatically positioned

K. R. WILSON FOUR-COLUMN PRESS

Model No. 100SE-4840

"GIVES US PRECISION ACCURACY FOR DIE-TRYOUT . . . SPEED AND VERSATILITY FOR SHORT PRODUCTION RUNS."

The new K. R. Wilson Four-Column, Down Acting Press recently delivered to Stewart-Warner Corp. does "double duty" in their Chicago plant. The 100 ton capacity press features an automatically-positioned pneumatic die cushion. With the cushion in position, the press can be used both for die-tryout and for production runs utilizing forming or drawing dies. When the cushion is retracted, spring loaded dies can be used. With the air evacuated from the cushion, the press can be used for blanking. With such operational flexibility, and rapid conversion features, the K. R. Wilson Model No. 100SE-4840 Press can be kept in nearly continuous operation. Get all the facts now on this time-saving, money-making press.

SPECIFICATIONS:

DIE CUSHION Capacity—tons	22.6
DAYLIGHT — in/max.	24
RAM STROKE — in	18
RAM SPEEDS — in/min.:	
Approach	160
Pressing	29
Return	250
CONTROLS — Electric Push Button	
20 H.P. UNIT	

HYDRAULICS DIVISION

K. R. WILSON, Inc.

OFFICES & FACTORIES — 210 MAIN ST., ARCADE, N. Y., U. S. A.

ability of the tutors to awaken interest as a prelude to enthusiasm, the ultimate goal. It won't be a speedy process, there's no time to lose, we must do it now or ourselves be done for.

If efficiently and imaginatively handled, such a course will not just collect all the loafers. In the early stages, some few may be attracted, but time will weed them out. Few shop loafers are fond of using their heads. Many of them would prefer a bit of hard graft, for which they are, mostly, best-fitted. They'd prefer that to using their thinkers, for which they are, as a rule, poorly equipped. The tea and the odd cigarette notwithstanding, the loafers could not very well sit silent, session after session, and get away with it. It would be for the instructor to separate the sheep from the goats, and some who attended for a rest cure might, under an interesting and persuasive instructor, become interested and active. At all events, loafing need not be tolerated indefinitely.

The idea behind this elementary course would be to brush up the lot and note the bright lads who could go on to a more advanced course. "Any questions" is an excellent way to gage the intelligence of a group, and that method should be a prominent feature of the proceedings. Ed., the old duffer, is merely splitting hairs when he should be more constructively employed supporting those engaged on splitting atoms. His objection that an hour's teaching per week doesn't make sense is beside the point. The course as outlined is only a beginning and can be extended if

"Now where the dickens did my steel wire gages go?"

Tool Steel Topics

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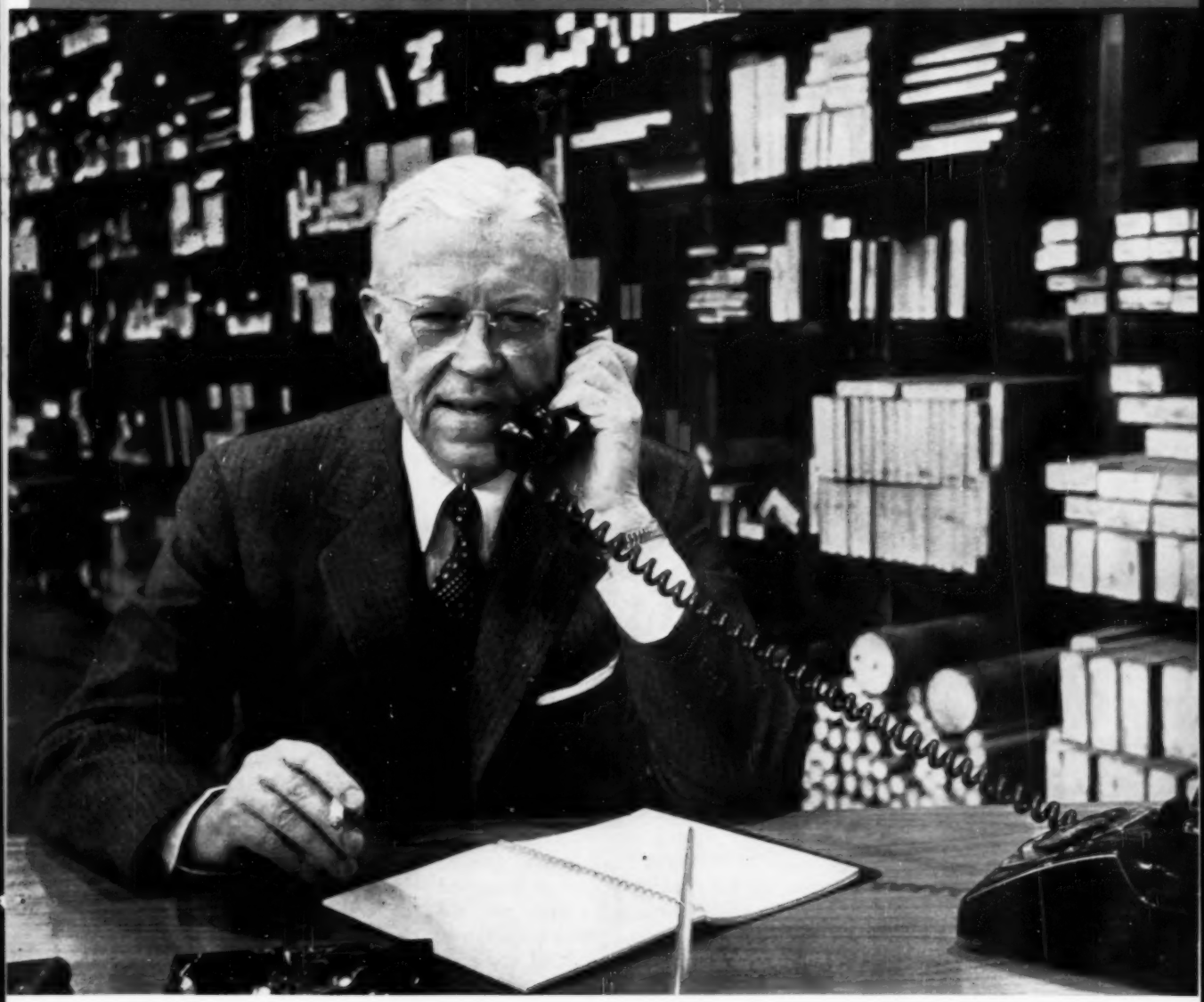

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Virtually every business day you are faced with a question or two about tool steel. On occasion the solution is relatively easy, such as ironing out some detail about delivery. But often it can be considerably more complex—perhaps weighing the merits of two similar grades, or determining the proper cycle of heat-treatment to obtain a more effective die life.

Whatever the problem, it calls for expert opinion, and that's where your Bethlehem tool steel distributor comes in. For he's a specialist in tool steel matters, and it's part of his job to see that your questions are answered promptly and courteously. Besides, he can also save you time when you need tool steel, for his diversified stocks are ready to go at a moment's notice. Make it a point to check with your Bethlehem distributor often. It will take but a few minutes at most, and it's one of the wisest moves you can make.

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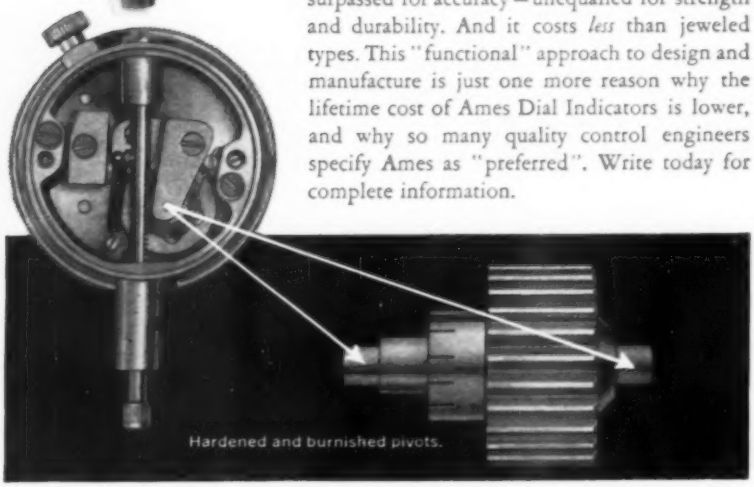
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the idea takes on. Besides, a lot of questions can be got through in an hour if the instructor knows his job.

Ed further suggests there are plenty of night-school classes the men can take if they are interested. Presumably, the course indicated by Al is intended to gather in the men not keen enough to go to night school. After thirty, few shop men care to go to night school where the majority are mostly youths. The shop course can be worked by age grouping; that is more popular with the over-thirties. Talks on similar lines to those under consideration are given on company time in nearly all large, progressive concerns here in Britain. There is no age limit but, generally, they are arranged roughly in age groups, at least, to the extent that sixteen and sixty don't rub shoulders.

D Mack
Lanark, Scotland

A SCHOOL for novices as proposed under the topic heading would probably be more instructive to the sponsors than to the students. They would soon find out that their endeavors were, for the most part, a costly waste of time. Desirable pedagogical principles emphasize the necessity of students having a similar background and a common objective.

In the grouping suggested, there would be a heterogeneous assortment of people. Some would have a lively interest in the lessons and some would be time-killers. Many would have the abilities necessary for the course and others would lack the requirements, such as those who would understand the most simple technical talk and those who would find it a foreign language.

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Part of the group, unwisely, would resent the thought of a further formal education while others would be defeated from the start by a false sense of inferiority. Even though attendance were on a volunteer basis the latter type might easily be pressured into being part of the class if "everyone's going." There's no way of controlling the make-up of a class if the invitation reads, "Come one, come all."

When the objective of an instructor is none other than what the men seem to need, he has as much chance of getting ahead as a snowball has in hell. The best of teachers can be buffaloed by the chronic arguer or the habitual filibusterer. How will the shop teacher be able to single these out and tone them down? In handling the queries of the group how can he know the best way of planning a lesson when things are taken care of as the men think them up? He has no way of deciding how much time should be spent on any one question because the unanswered inquiry which is to follow may be more valuable than all that has gone before.

Another unforeseen problem is that of the time element. One could easily volunteer for the class and decide to go only during the part of the hour that covers company time. Of course, eventually, disciplinary measures could eliminate him, but how many times would he be excused from the second part of the hour before his evasive methods were detected?

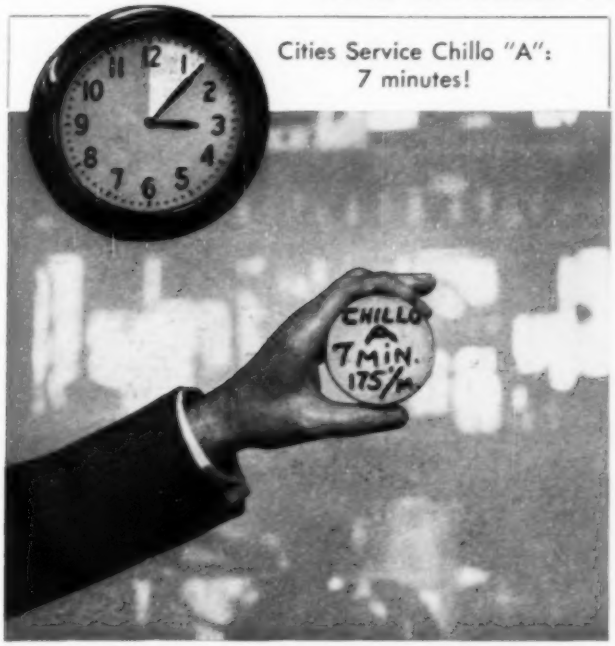
If a plant wants to have assurance that its new help will quickly acclimate themselves to its own peculiar functionings, let the employment office give aptitude tests to all applicants. They are a good forecast of how well a person can adjust to new situations. Not only that, they often reveal more about a person than is gained from the routine interview.

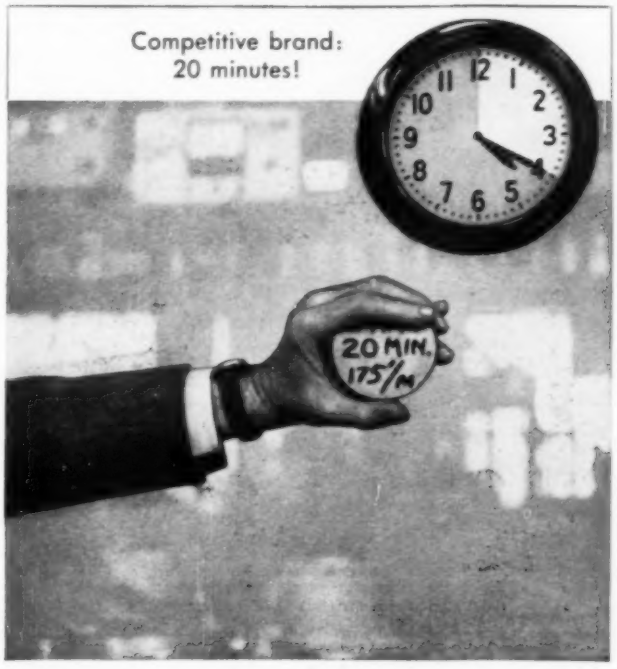
Indeed if a man has to learn the peculiar ways of a company according to his own devised plan he might easily come across a better way of doing an operation. In class he receives an answer without thinking something out, whereas if he has to get the answer for himself he must use his brain, and no two brains work alike. He just might improve the situation. This experience seems to be more advantageous than the class room instruction. The school of hard knocks taught more than any instructor ever did.

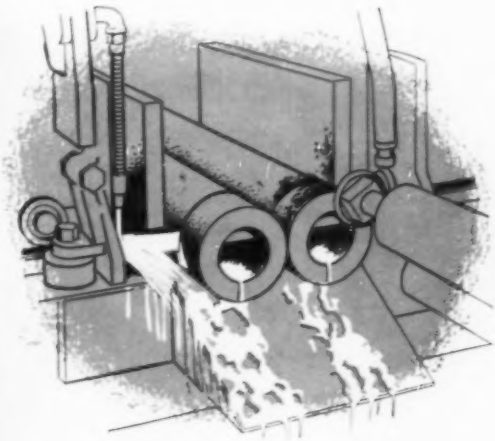
Neal A Mack
Belle Harbor, NY

Cutting Oil takes the time test

at S. G. Frantz Co., Inc., Trenton, N. J.







S. G. Frantz Company decided to keep a truly open mind.

They'd been using Cities Service Chillo Cutting Oil and other Cities Service products for some time with great satisfaction. Still, there was no harm testing Chillo Cutting Oil against another brand just to make sure they were getting maximum results.

But even the people at S. G. Frantz never expected what followed. Using the competitive oil, and a piece of 4130 aircraft rod, $2\frac{7}{8}$" in diameter, they made a single cut at saw speed of 175 feet per minute. Time: 20 minutes.

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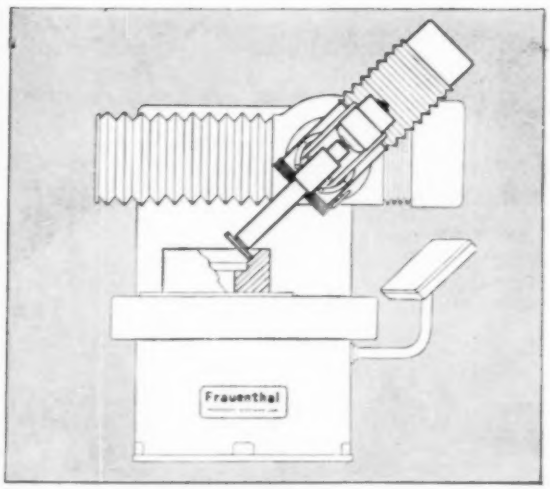
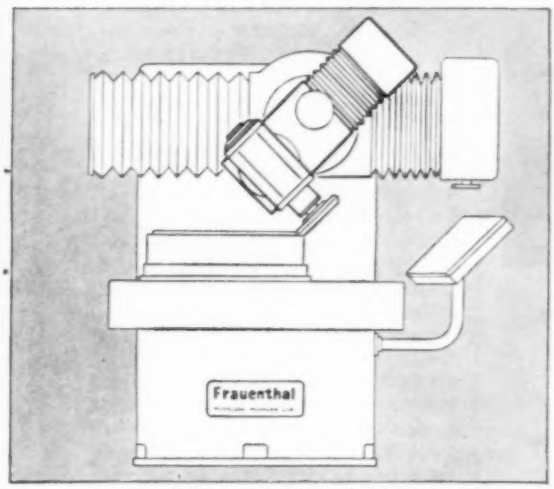


Frauenthal belt-driven Model 1224B and 1236B single spindle, vertical precision grinders have an extreme angle setting of compound at 45°. Versatility such as this permits angle, internal, external and face grinding to millionths-of-an-inch related tolerances.



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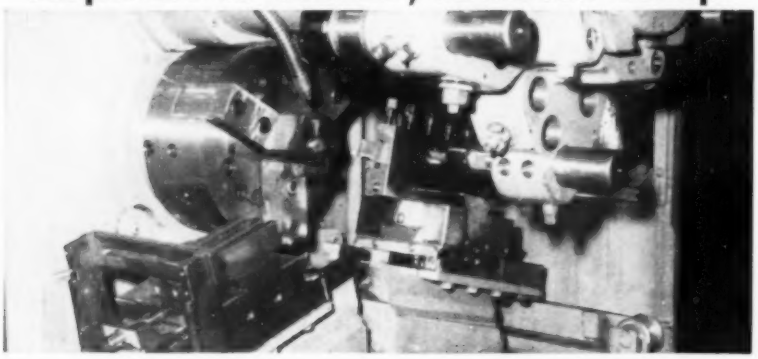

If you use automatics, this report from A. F. Gabriel, V-P Eng. & Prod., Acme Industrial Co., Chicago, should be of value.

"We have set up your 10" air operated chucks as standard equipment on our machines . . . many parts require repeat chuckings . . . most have extremely close concentricity requirements. With Buck chucks we can repeat to tolerances of .0005* and less . . . your chuck has allowed us to improve quality and has reduced our scrap."

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INVESTMENT CASTING ENGINEERING AND DESIGN MANUAL. *Published by Investment Casting Institute, 27 East Monroe St, Chicago 3, Ill. 50 pages, 8 x 11 in. in loose-leaf binder. Price $5.00.*

Intended as a practical working manual for the design engineer, metallurgist, and purchasing man, this book offers a short, concise statement of the investment casting process, its operating requirements, and its capabilities and limitations, along with a group of case histories showing how the process has solved various metalworking problems.

Not only are the advantages explained, but in the chapter on design, the practical limits are also clearly set forth in terms of surface finish, dimensional tolerances, positioning of holes, coordinated contours, and other significant factors.

One section is devoted entirely to the metal specifications and test bar standards that have been agreed upon in the industry.

The book is the result of the combined efforts of many companies actively engaged in investment casting and should therefore be an authoritative source of information.

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AUTOMATION IN PRACTICE — *By S E Rusinoff, professor of mechanical engineering, Illinois Institute of Technology. Published by American Technical Society, 848 E 58th St, Chicago 37, Ill. 261 pages, 5½ by 8¼ in. Price $6.50.*

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The basic elements employed in automated equipment are described in considerable detail. Five chapters are devoted to hydraulic, pneumatic and electrical controls, pumps, cylinders, valves, servomechanisms, automatic timing controls, electronic computers, data processing systems and similar equipment. In most instances, examples are given to indi-

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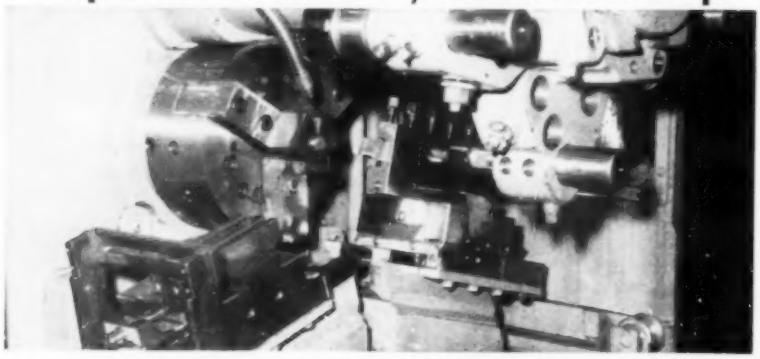

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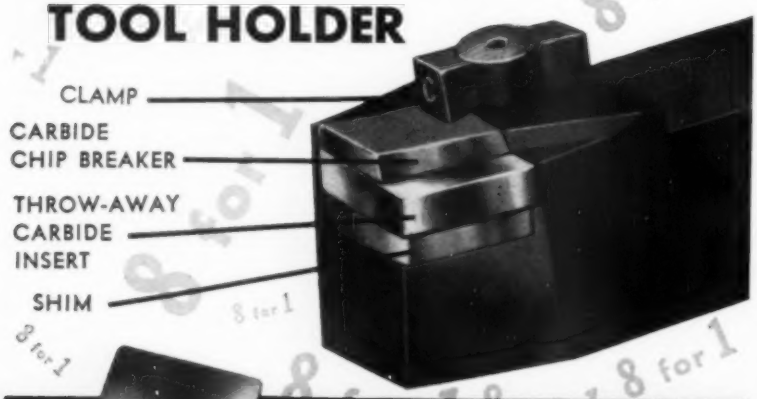

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cate typical applications of these devices in automation.

The remaining eight chapters describe automation in particular manufacturing processes. These include the production of metals, metal casting, mechanical working, press working, metal cutting, heat treating, metal joining and inspection. The material is treated primarily in terms of processes rather than in terms of particular industries or products. As a result, the book provides general information on automation together with a discussion of practical applications.

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PRACTICAL AUTOMATION—*By Lester R Bittle, Morley G Melden, and Robert S Ride, associate editors,* Factory Management and Maintenance. *Published by McGraw-Hill Book Co, Inc, 330 W 42nd St, New York 36, NY. 376 pages, 8¼ by 11 in. Price $7.50.*

Material for this book is based on articles selected from *Factory Management and Maintenance* magazine to cover a wide range of problems encountered in automation. Each of four sections of the book—Fundamentals of Automation; Automation in Manufacturing; Plant Engineering and Maintenance for Automation; and Management of Automation—includes a discussion of the subject covered and is made up of related chapters. The first section, for example, (Fundamentals of Automation) is made up of five chapter headings: What Automation Means to You, How You Can Automate, Automation — Piecemeal, Automation—Full Scale, and Automation in Job Shops and Small Plants. Articles relating to these subjects make up each chapter.

About 159 cases of practical automation are thus described and range from a question-and-answer interview with an automation builder through the effect of automation on particular plants, and from descriptions of how automation was achieved at other plants to case histories of automation and various applications of automated equipment. Descriptions of maintenance and management problems, and how they were solved by particular firms, are also included. Thus covering actual applications of automation in various plants, the material is arranged to serve as a guide in planning. In general, the book presents an accurate picture of automation as it is practiced in American industry today.

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Illustrated above is the newest Van Keuren Gear Wire Set No. 84

Set No. 84 is a multi-purpose set designed to cover a range of 26 diametral pitches from 2 to 80 with wires from each of four different and popular wire series:— 1.92, 1.728, 1.68 and 1.44. Because of duplication of wire sizes, this set which would normally involve 104 sizes reduces to 84 sizes. The economy here is evident.

The latest VK Gear Measuring Tables, available in Catalog and Handbook No. 36, have been arranged for use with all four of these gear wire series. Thus the set can be used in conjunction with the tables in many ways, such as:

Tooth Thickness — Measuring *tooth thickness* of internal and external spur gears, splines and serrations.

Involute Profile — Checking *involute profile* by using more than one wire size. Series 1.92, 1.728 and 1.68 for externals. Series 1.68 and 1.44 for internals.

Helical Gears — Measuring *helical gears* when normal diametral pitch is one of the 26 for which the set was designed.

Enlarged Pinions & Reduced Gears — Measuring *enlarged pinions* and *reduced gears*. (tables are now available for the first time in VK Circular G58, giving measurement values and change factors for reduced gears which mate with pinions enlarged in accordance with the latest American Standard covering involute fine pitch gears).

Complete information regarding the use of gear measuring wires is contained in a fifty-page section of the VK Catalog and Handbook No. 36. Included in this section are the most complete gear measuring tables available, as well as all necessary formulas and equations for computing non standard spur and helical gears. Numerical examples are included. This book is available on request.

VK Gear Wires are held within .000025" for roundness and exact size. Surface finish is 1.5 RMS or better.

If complete coverage of all series is not necessary, sets covering single series such as 26 Ex. or 26 Int. are also available. See Catalog No. 36.

VK

39th YEAR

THE Van Keuren CO.

173 WALTHAM STREET, WATERTOWN, MASS.

Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Carbide Pivots . . . Precision Lapping Service.

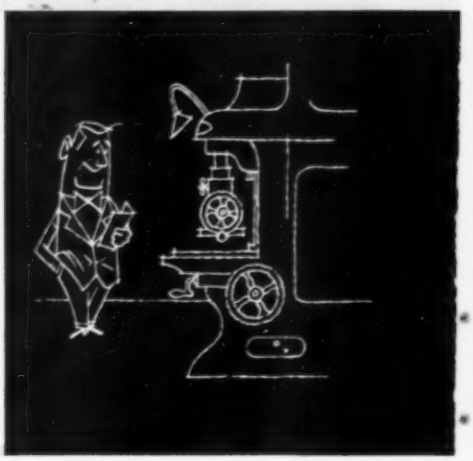
TOOLING FOR COMPETITION

ATTEND THE 1958 ASTE TOOL SHOW AND CONFERENCE

CONVENTION CENTER
PHILADELPHIA, MAY 1-8

SEE all the very latest advancements and improvements in more than thirty major categories of industrial products.

It's the year's most notable industrial event . . . it's your chance to see tooling's future, *your* future on display, at *one* time under *one* roof . . . it's the 1958 *TOOL SHOW!* See for yourself all the newest developments in manufacturing equipment, all the latest ideas in production methods. See thousands of products, hundreds of product demonstrations, presented by 487 exhibitors. Don't miss it. Plan *now* to attend.



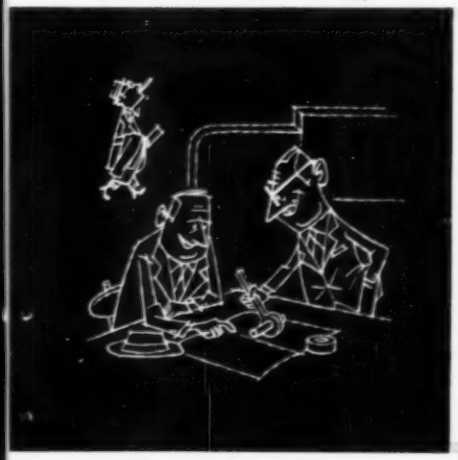
ATTEND top level conferences, conducted by recognized authorities on the newest production techniques and developments.

Symposia, panels and technical papers (more than 80 of them) will be devoted to timely subjects of vital interest to today's industry . . . subjects like the following . . . Automation* • Materials of the Future • Numerical Control • Guided Missiles • Plastic Tooling • Nuclear Engineering • Shaped Diamond Tools* • Planning for Profit • Ceramics • Powdered Metal Parts Tooling • European Tool Engineering • Gauging Techniques • Safety Engineering • Metal Cutting* • Shell Molding.

*Symposium

MEET and exchange ideas with management, engineering, production, sales people from the nation's leading industrial concerns.

Industry's "D-men" . . . designers, deciders, doers . . . will be out in strength for the 1958 *TOOL SHOW*. ASTE's Registration Listings, in fact, read like blue ribbon rosters of industrial America. And small wonder! . . . for the ASTE *TOOL SHOW* is industry's greatest open forum for exchanging ideas, solving problems, *"tooling for competition"*. What better opportunity for keeping yourself informed and up-to-date? . . . and what could be more important in these competitive times?



INSPECT the modern equipment and up-to-the-minute manufacturing methods being utilized in booming Delaware Valley plants.

Yes, you'll have an opportunity to see industry in action, too, because arrangements have been made for 28 tours through Philadelphia area plants . . . including the U.S. Navy Yard.

These 14 plants will be open for your inspection . . . Standard Pressed Steel • U.S. Steel • Leeds & Northrup • Chrysler-Plymouth • Cuneo Eastern Press, Inc. • Campbell Soup Co. • I.T.E. Circuit Breaker • Schramm, Inc. • Yale & Towne • Budd Company • Brown Instrument • Link-Belt • Fischer & Porter • Curtis Publishing.

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Detroit 38, Michigan

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COMPANY _____

ADDRESS _____

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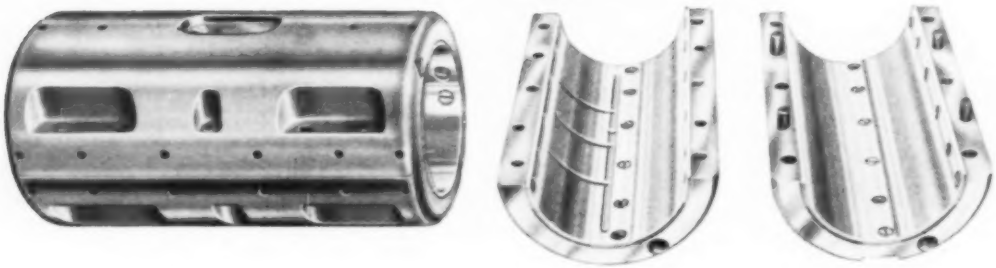
AMERICAN SOCIETY OF TOOL ENGINEERS

TOOL SHOW CONFERENCE '58 MAY 1 TO 8

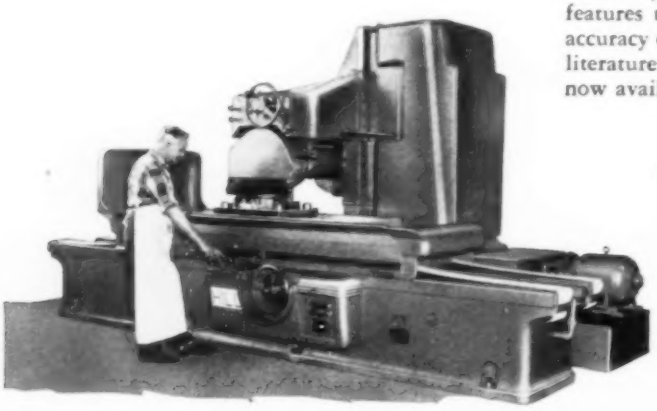
Novel Design provides *Astonishing Bearing Life*

The life of the HILL front spindle bearing on HILL horizontal spindle hydraulic surface grinders is truly astonishing. This bearing has been an *exclusive* HILL feature for more than 15 years. The necessity of replacement, under constant use, is practically unknown.



The front spindle bearing on HILL horizontal spindle hydraulic surface grinders was engineered by the HILL ACME COMPANY and has proven in the field to operate indefinitely. An alloy bronze bushing is fastened to a semi-steel casting with brass screws. The bronze bushing is undercut lengthwise in four equidistant locations on the outside diameter to allow for spindle expansion. (Darker areas in photo show undercut sections.) A perfect bearing surface is established in the I.D. of the bronze directly opposite the undercut sections. Oil is forced into specially designed concave relief areas which act as oil wedges assuring long bearing life. Hardened dowel pins guide the two halves together to their original position. The bottom half of the bearing has an oil return slot shown at the edge of the half section on the outside diameter. Note that there are NO oil grooves in this bottom half or in the quarter half of the top section. The shaft rotation spreads the oil film from the oil distribution grooves to the perfect bearing surfaces. Any additional oil grooves would act as scrapers and be detrimental to the oil film formed around the spindle.

This is just one of the many exclusive construction features that result in the longer life and permanent accuracy of HILL heavy duty surface grinders. Detailed literature on these high-precision machine tools is now available.



24" x 24" x 72" HILL horizontal spindle surface grinder grinding blanking dies to extremely close tolerances. Also built in Vertical Spindle design.

THE HILL ACME COMPANY

HILL DIVISION . . . . . **ESTABLISHED 1882**

1201 West 65th Street • Cleveland 2, Ohio

HILL ACME TOOLS TO INDUSTRY

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

NAMES IN THE NEWS...

Paul W Johnson has been named general manager of International Harvester Co's Farm Tractor Division. Formerly Louisville works manager, he succeeds **Dan Chimenti**, appointed director of manufacturing.

Joseph I Andreini, former vice president, operations, of Borg-Warner's Pesco Products Division, Bedford, Ohio, has been made manager of manufacturing operations for Bucyrus-Erie Co's plants in South Milwaukee, Erie, Penna, Chicago, and Evansville, Ind.

Carl F Leitten, executive vice president of Electro Refractories & Abrasives Corp, Buffalo, has been elected president and chief executive officer. He succeeds **Grant S Diamond**, named chairman of the board.

R L Fairbank, vice president of Towmotor Corp, Cleveland, has been elected president of the Material Handling Institute, Inc, headquartered in Pittsburgh. **Eugene Caldwell**, president of Baker-Raulang Co, Cleveland, is 1st vice president, and **C L Fell**, vice president, marketing, of American MonoRail Co, Cleveland, 2nd vice president.

Frank L Brugger has been named product sales manager for metalcutting tools made by Kennametal Inc, Latrobe, Penna. He has been representing the company in the Milwaukee area for the past eight years.

Carl Neisser has been named manufacturing manager for the Systems Division of Beckman Instruments, Inc. He will be responsible for operations at the division's Anaheim, Calif, headquarters plant, and the coordination of production functions with Systems' northern facility at Richmond, Calif.

O W Carpenter, vice president, construction machinery and finance, has been elected executive vice president of Chain Belt Co, Milwaukee. Additional elections: **W C Messinger**, manager, construction machinery division, to vice president, construction machinery section; **E M Rhodes**, manager, industrial equipment section, to vice president of the section; and **G H Woodland**, general sales manager, industrial equipment section, to vice president, marketing.

Robert E Sadler has been named assistant sales manager of the Tool Division of Billings & Spencer Co,

"Nous Sommes Ici!"

When you need it NOW call Wheelock-Lovejoy!
—for Alloy Steel bars, billets, forgings

Some jobs won't wait for red tape. When you want steel *in a hurry*—just pick up the phone and call your nearest Wheelock, Lovejoy warehouse.

Expert W-L metallurgists will help you choose the right stock for the job.

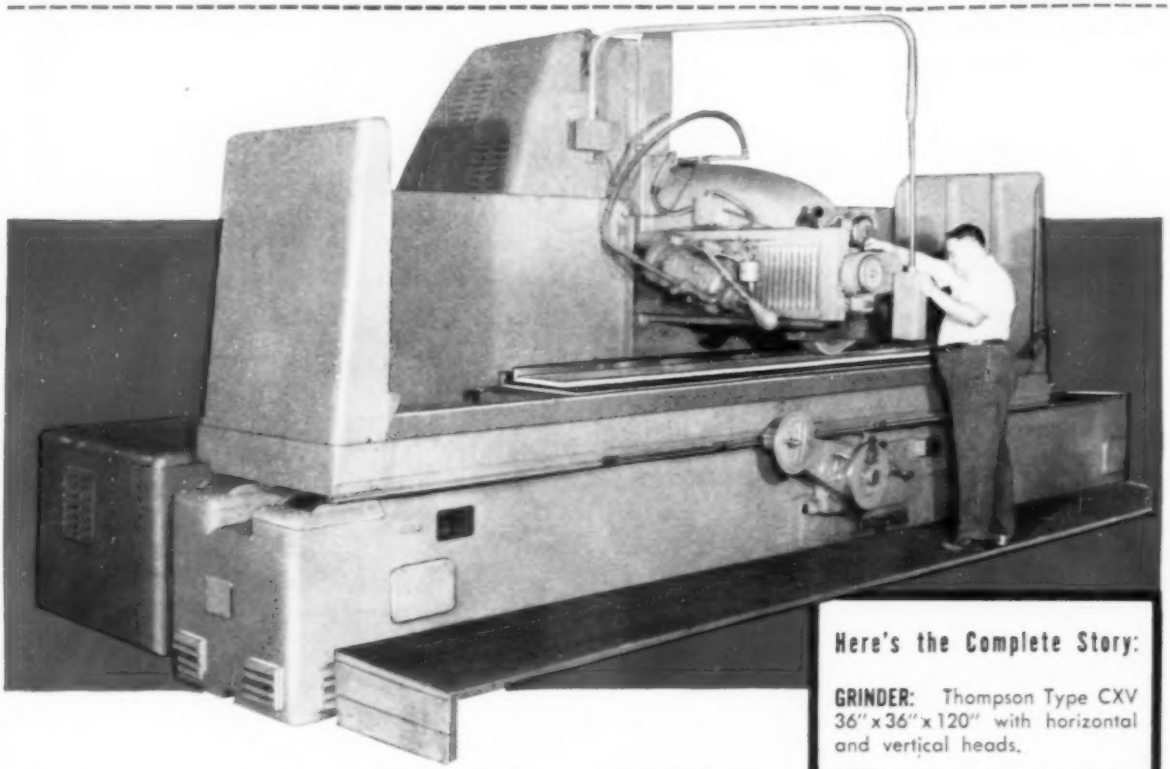
Write our Cambridge office today for your *free* Wheelock, Lovejoy Data Sheets. They'll give you complete technical information on grades, applications, physical properties, tests, heat treating, etc.

Warehouse Service—Cambridge • Cleveland • Chicago Hillside, N. J. • Detroit • Buffalo • Cincinnati • *In Canada*—Sanderson-Newbould, Ltd., Montreal & Toronto.

WHEELOCK, LOVEJOY & COMPANY, INC.
137 Sidney Street, Cambridge 39, Mass.

When large parts must be ground to total tolerances of .0005" or less . . . .

THOMPSON GRINDERS WITH THE NEW HYDRA-COOL HYDRAULIC SYSTEM SOLVE THE PROBLEM!



Machine ways up to 118" for The Michigan Tool Company's Roto-Flo Spline Rollers must be ground to .0005" total tolerance. Heat distortion, caused by hydraulic heat, became a critical problem in achieving this tolerance.

During the three months of operation since the installation of Thompson's new Hydra-Cool Hydraulic System*, these long ways are being ground to consistent .0003"-.0004" total tolerances. Heat distortion is eliminated. Scrap loss is reduced to zero. Grinding time is greatly reduced.

THOMPSON GRINDERS WITH THE NEW HYDRA-COOL HYDRAULIC SYSTEM MAY BE THE ECONOMICAL SOLUTION TO YOUR GRINDING PROBLEM. WRITE TODAY FOR FULL PARTICULARS.

Hydra-Cool also offers you these exclusive advantages:

- Heat damage to hydraulic seals, valves, controls and pump is eliminated.
- Break down of additive-type hydraulic oils is prevented—sludge will not form in the Hydra-Cool System.
- Lengthy warm-up periods are eliminated.
- Power costs are greatly reduced.

Hydra-Cool is standard on all Thompson surface grinders 40 inches and up in work length AT NO EXTRA COST.

Here's the Complete Story:

GRINDER: Thompson Type CXV 36"x36"x120" with horizontal and vertical heads.

PART: 118" way for Michigan Tool Co. Roto-Flo Spline Roller.

RATE OF TABLE TRAVEL: 100 ft./Min.

MATERIAL REMOVED: .065".

METAL: Flame hardened Ductile Iron.

WHEEL: 20x4x12 H Grade.

SCRAP LOSS: None.

GRINDING TIME: 3-4 hrs.

Thompson SURFACE GRINDERS

THE THOMPSON GRINDER CO., Springfield, Ohio, U. S. A.

"Keep THOMPSON in mind for that daily grind"

*Pat. Applied For

Hartford, Conn. He was formerly manager of the Industrial Supply Division of L L Ensworth & Sons, Hartford.

Vincent P Blair has been named general manager of Delco Products Division of General Motors at Dayton, Ohio. Formerly controller of GMC Truck & Coach Div at Pontiac, Mich, he succeeds **Frank H Irelan,** who has retired. **Carl C Rigsby,** factory manager of GM's Packard Electric Div, Warren, Ohio, has been appointed general manager to succeed **B N MacGregor,** retired.

Herman W Stieglitz has been elected vice president, engineering, of Thomson Electric Welder Co, Lynn, Mass. He was formerly manager of sales and engineering.

William T Griffiths, sales representative, has been promoted to assistant sales manager of Peck, Stow & Wilcox Co, Southington, Conn.

William H Mutschler has been appointed chief engineer of Allis-Chalmers 'Pittsburgh Works. Formerly patents and standards engineer there, he succeeds **W M Terry, Jr,** recently named director of engineering coordination for the company's Industries Group. Additional A-C appointments: **J D Harmison,** manager of parts sales for the Tractor Group, to sales manager, material handling, of the Buda Division; and **Howard C Carless,** engineer in charge of transformers at the Terre Haute (Ind) Works, to assistant general manager there.

Joseph R Graham has been appointed manager of the Instrument Division of Haydu Electronic Products, Inc, Plainfield, NJ. He was previously general foreman of the Instrument Division of Waltham Precision Instruments.

Robert Twells has been appointed group executive in charge of the Spark Plug Division of Electric Auto-Lite Co, Toledo. Formerly manager of the company's Fostoria, Ohio, plant, he is succeeded there by **Duane E Richardson,** who has been serving as assistant manager.

William C Miller, formerly associated with the Beryllium Corp, has joined National Precision Casting Corp, Reading, Penna, as sales manager.

Ivan Speer, management assistant, has been promoted to assistant manager of AiResearch Manufacturing Co, Phoenix, Ariz.

SHELDON Precision LATHES

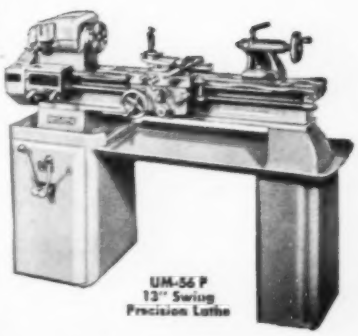
for the size Lathes You Need Most

Sheldon lathes are built in the sizes you need most, for toolroom and production jobs. They are available with swings of 10", 11" and 13"... in varying bed lengths with 18" to 48" center distances . . . and . . . in your choice of pedestal, cabinet or bench mountings.

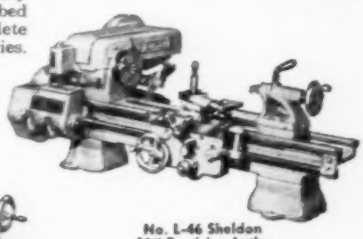
Powerful, all-V-belt, drive units – either the standard 8-speed (or 16-speed) E-drive; or the production favorite, a rapid, lever-shift U-drive. Where higher spindle speeds are desired, the standard E-drive can be built to provide speeds up to 2,000 r.p.m.

All Sheldon Lathes have handscraped, built-in precision. Each lathe is guaranteed to meet or surpass the American Standards for Toolroom Accuracy. With every Sheldon Lathe goes a copy of the accuracy tests actually performed on that lathe. (19 checks).

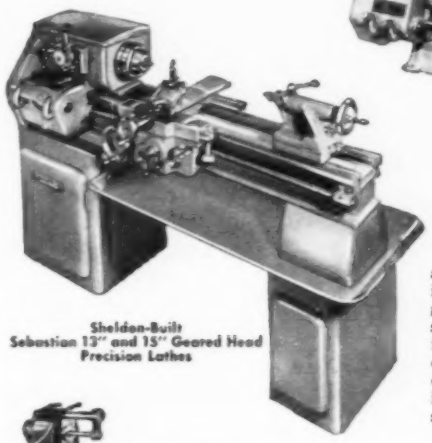
Important optional features include: hardened bed ways, L00 Long Taper Key Drive spindles, 4" D1 Camlock spindles, bed turrets, taper attachments and a complete line of toolroom and production accessories.



UM-56 P 13" Swing Precision Lathe



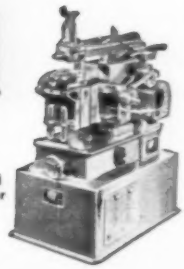
No. L-46 Sheldon 10" Precision Lathe



Sheldon-Built Sebastian 13" and 15" Geared Head Precision Lathes

The new Sheldon-built Sebastian Geared Head Lathes have greatly increased work capacity and many advanced features. These include a wide, heavy, hardened and ground bed . . . easy shifting spindle speed dial . . . 60-pitch gear box . . . independent drop lever apron clutches . . . cam-action tailstock clamp . . . and, automatic lubrication in the headstock and apron with "1-shot" lubrication of carriage.

SHELDON Horizontal Milling Machine



SHELDON 12" Shaper

Send in coupon or write for catalogs and names of nearest Sheldon and Sebastian Distributors where you can see these new lathes in operation.

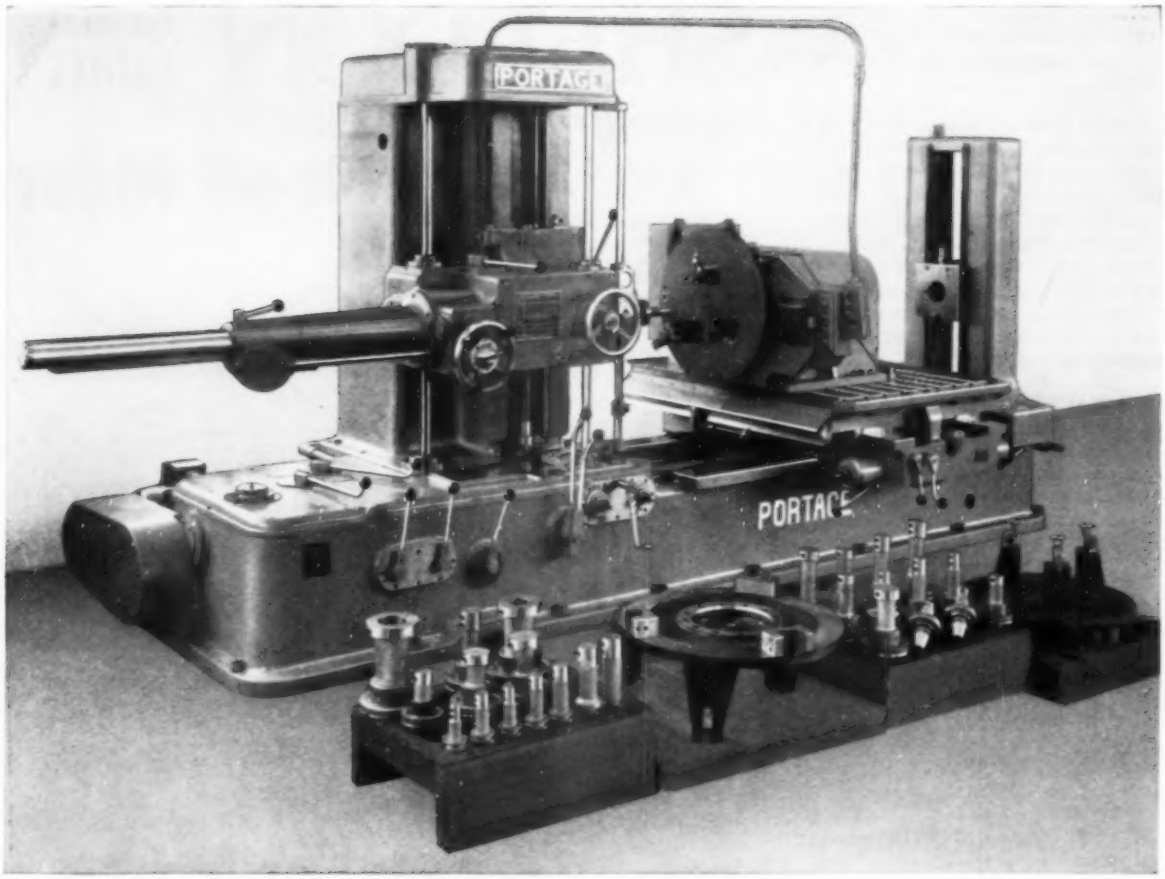
SHELDON MACHINE CO., INC.
4234 North Knox Avenue, Chicago 41, Illinois

Gentlemen: Please send new catalogs describing:

☐ Sheldon ☐ 10", ☐ 11" ☐ 13" Lathes
☐ Sebastian 13" and 15" Geared Head Lathes
☐ Horizontal Milling Machine ☐ Name of Local Dealer
☐ Sheldon 12" Shaper ☐ Have representative Call

Name ..... Title .....
Company Name .....
Street Address ..... ☐ Company ☐ Home
City ..... State .....

SHELDON MACHINE CO., INC.
4234 N. KNOX AVE. • CHICAGO 41, ILLINOIS



Tooling is P.D.Q. Quick Change including Sure-Bore micrometer cartridges.

PORTAGE builds "special tooling" on new 4 inch Horizontal Boring, Drilling and Milling Machine for...Westinghouse Gearing Division

Write for Catalog covering the 4 and 5 Inch PORTAGE MILLS

This new 4 inch machine was built with a special vertical power indexing table. Unit can be set to index at any range with variables of 15 degrees between stations. Indexing accuracy can be held to less than 5 seconds of arc. Indexing and clamping are fully automatic with means for inching the table for setting-up purposes. This Westinghouse machine is just one example of the special purpose work being done for PORTAGE customers . . .

The Portage Machine Co. invites your inquiry for machines requiring special tooling . . . and remember . . . it costs less to buy, operate and maintain a PORTAGE.

THE Portage MACHINE CO.

1026 Sweitzer Avenue • Akron 11, Ohio

Representatives in Principal Cities

BUILDERS OF PRECISION MACHINE TOOLS, SPECIAL AND PRODUCTION MACHINERY SINCE 1916

R B&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

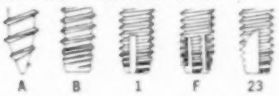
Technical-ities

By John S. Davey

How to select tapping screws

1. Use *thread forming* screw Type A, B or C when material is ductile enough to stand deforming action of screw. If not, use *thread cutting* type.

2. Type A is used with pierced hole for starting; and where an exposed point doesn't matter. All other cases use B, C, or other blunt screws in drilled holes.



3. When load is no factor, metal gauge determines diameter of screw. Pick a thread pitch which gives at least a full thread engagement.

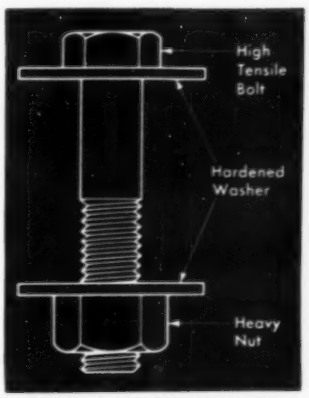
FOR EXAMPLE: Metal .062" thick suggests use of #7 Type A or #10 Type B (both have 16 threads/inch).

$$\text{PITCH} = \frac{1.00}{16} = .0625"$$

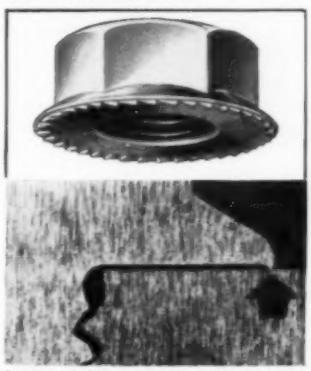
4. When you do have loads to sustain, you must consider required holding power. If metal thickness doesn't allow ample thread engagement (so that threads strip), use more smaller diameter screws. They engage more threads. Limiting factors: the screw's torsional strength, and the effort to drive it.

5. If, due to material thickness, screws fail by torsion or drive too hard, select cutting screws (1, F, or 23). For hard ductile materials, the Type 1 is best; for soft, friable materials, the Type 23.

Two basic ways to keep fasteners tight



RB&W high strength bolts permit optimum tightening without crushing surface when used with hardened washer.



Section of Spin-Lock screw. Teeth embed only with proper tightening. Same feature available in nuts.

Fasteners that stay tight keep joints strong. Resistance to loosening depends largely upon: (1) The inherent "locking" ability, (2) The man with the wrench.

HIGH PRELOADING

With rigid type joints, one of the best "locking" fasteners is a standard RB&W high strength bolt or cap screw . . . *torqued up close to its yield strength.* It locks by its own internal residual tension.

High tension not only keeps it permanently tight, but also prevents fatigue, assures optimum load capacity and safety.

INTEGRAL LOCKING DEVICE

Suppose the design of fastened members can't take full advantage of such preloading? Then a lock is needed, such as that furnished by RB&W Spin-Lock® screws and nuts. Ratchet-action teeth bite into seat; require 20% extra torque to loosen.

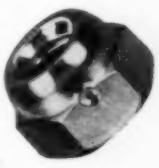
Note that Spin-Lock fasteners seat solidly before locking. The installer can't be deceived. He *has* to tighten properly before feeling resistance.

In both cases above, *positive* tightening assures positive fastening.

Send for Bulletin on Spin-Lock fasteners, or call your local RB&W Fastener Man. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, New York.

Plants at: Port Chester, N.Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

Staked acorn nuts lock securely



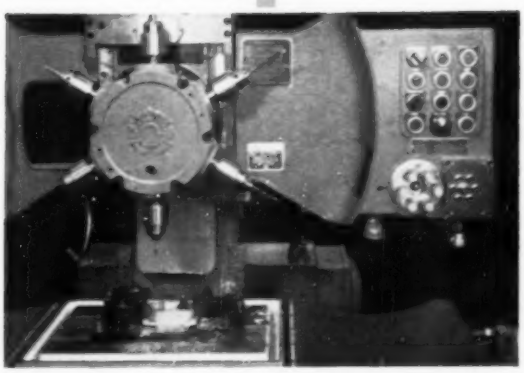
Staking opposite sides of these RB&W acorn nuts deforms threads for a positive grip. It also puts middle of nut slightly out-of-round, for a spring tension locking effect. They're designed for applications such as outdoor furniture, where anchoring fasteners is more important than solid seating. Available in aluminum, steel, silicon bronze.

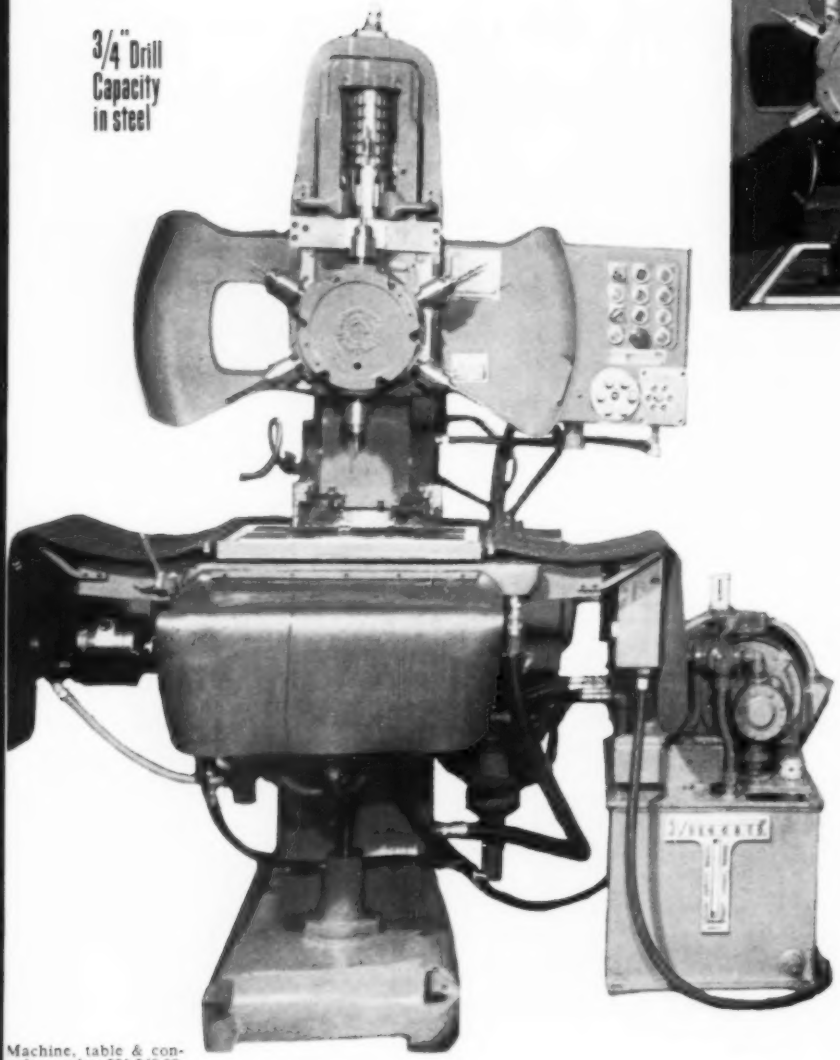
These all-metal nuts can also be furnished in regular double chamfered style. Since they lock with their middle threads, they can be turned onto screw from *either* side.

50% Less Machining Time!

Burgmaster Electropoint

3/4" Drill Capacity in steel



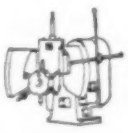


Machine, table & controls complete $21,240.00.
30 Day delivery.

Specialists in High Production Turret Drilling

1C Manual Power Index 3/8" Capacity

2B Manual Power Index 3/4" Capacity



2BF Flange Mounted Power Index 3/4" Capacity

2BH Automatic Hydraulic 3/4" Capacity

3BH Automatic Hydraulic 1½" Capacity

2BR Ram Type Radial Drill 3/4" Capacity

2BHT-3BHT Automatic Tape Controlled 3/4" and 1½" Capacity

50% Less Tooling Costs and Lead Time!

Six-Spindle Turret Drill

with *Automatic* Numerical Controlled Positioning Tabl

Aircraft instrument gear housings are now precision drilled and bored with 50% less machining time and 50% less tooling cost and lead time on a Burgmaster Electropoint Six-Spindle Turret Drill. Six different operations including center drilling, drilling, reaming, and boring, 5 different diameters, and 12 holes are machined in 3½ minutes floor to floor within ±.001" location. But this is only part of the story.

1. The Automatic Cycle eliminates fatigue—and produces consistent accuracy with practically no scrap loss.

2. Fixture rework time which averages six weeks can now be handled in five minutes—Just Scotch tape old holes on the control tape and punch in the new data.

3. Only simple holding fixtures are required—eliminating drill and reamer bushings and expensive jig boring time to fabricate—reduces lead time 50%.

4. Tools run at most efficient preselected speeds and feeds—greatly extends tool life and eliminates tool breakage.

5. Quick set-up permits economical machining of small lots—and provides extreme flexibility and versatility.

The Burgmaster Electropoint Control System may be applied to either new 2BHT-6 spindle or 3BHT-8 spindle Turret Drills or machines now in service. The standard hydraulic Burgmaster controls are maintained including pre-selective spindle speeds, infinitely variable pre-selective feeds, selective rapid approach and return, skip indexing, precision depth control, and simple manual controls for set-up. The Electropoint System automatically controls all machine functions, selects spindles in any sequence, automatically positions the table simultaneously on two axes, and clamps it in position while machining operations are being performed. All operations are carried out at their most efficient rate for high finish, precision, speed, and longest tool life.

Check into Burgmaster Electropoint Tape Controlled Turret Drilling, Tapping, and Boring Machines for your work. They can save you money from prototype to mass production work. There is a Burg direct representative or dealer near you. Call him—there is no obligation.

JOB FACTS

Machine: Burgmaster Electropoint 2BHT–6 Spindle Turret Drilling, Tapping, and Boring Machine.

Part: Aircraft Instrument Gear Case.

Material: Aluminum alloy.

Quantity: 200

Holding: Simple Locating and Clamping Fixture.

Accuracy: Within ±.001" Without Bushings.

Accuracy Required: ±.0025".

Tools: H.S.S.

Program Part: 1½ Hours.

Punch Tape: 15 Min.

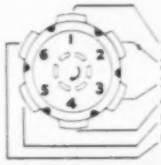
First Set-up Time: 1½ Hours.

Floor to Floor Time: 3½ Min.

Former Method: 6 Spindle Table Type Drill.

Former Time: 7 Min.

Savings: 50% Floor to Floor Time, and Floor Space.



Operations	Diameters	Feed per Min.	Speed RPM
1. Center Drill	4 Holes at Top	.004	1500
2. Drill 4 Holes	.139/.135 x .563 Deep	.004	2000
3. Drill 4 Holes	.183/.179 Thru	.005	1300
4. Ream 4 Holes	.180/.181	.008	1000
5. End Mill 3 Holes	.260/.250 x .164 Deep	.005	1000
6. Drill 1 Hole	.340/.330 Thru	.006	650

Tape Preparation—Decimal numbers and machining sequence date are punched directly into the tape (requiring no special training, codes, or computers) at an average rate of one minute per command block.

Machine Display—The display shows at all times the actual position of the table to three decimal places and the number of the operation being performed in the machining sequence. The display reads Table Positions +.0000 to —.0005. The system provides "Manual Control," "Semi-Automatic Control," "Automatic Control," or Standard Burgmaster Automatic Hydraulic Control.

Write for bulletin describing Burgmaster six and eight spindle Electropoint Tape Controlled Turret Drilling, Tapping, and Boring Machines. Thirty minute 16MM sound film showing all Burgmaster Turret Drills in operation available from any office without charge.

Dept. 1.

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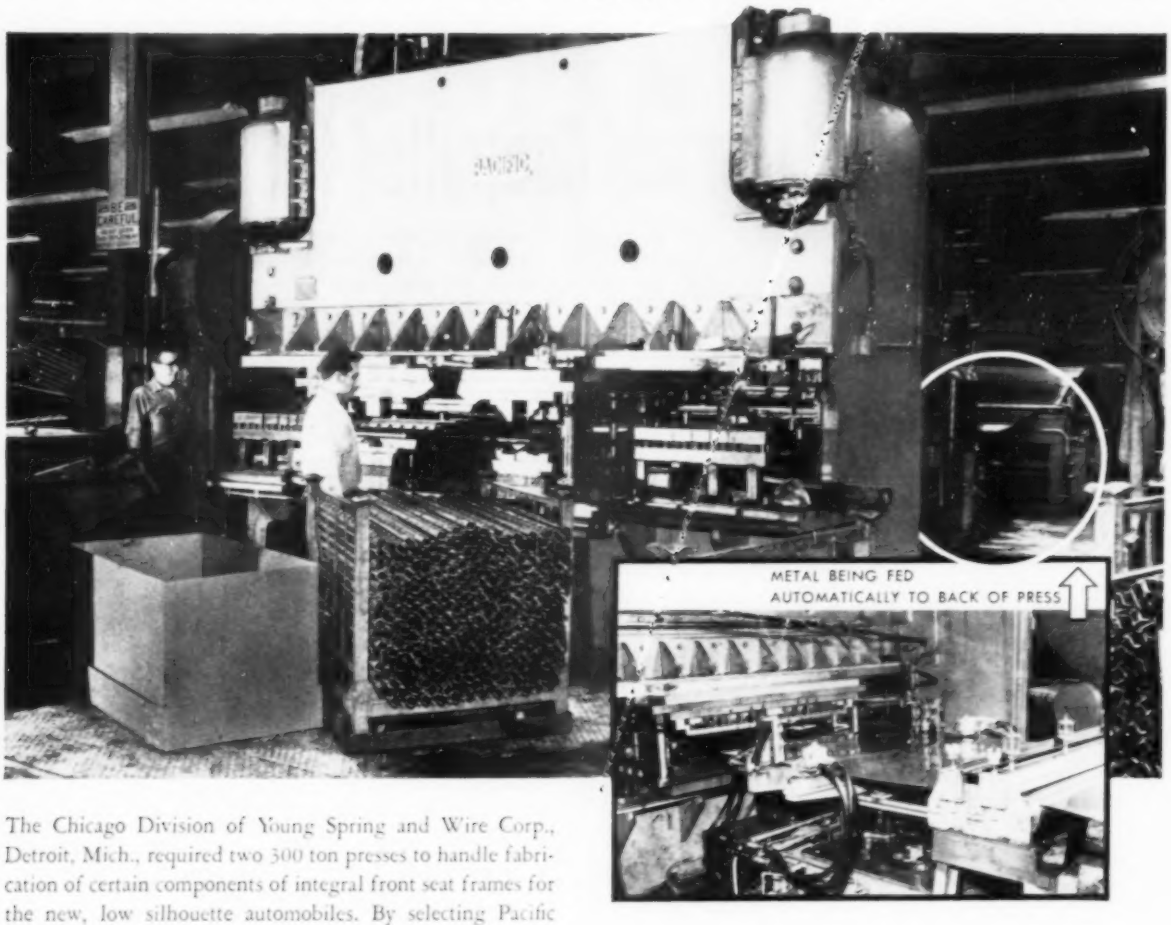

The Chicago Division of Young Spring and Wire Corp., Detroit, Mich., required two 300 ton presses to handle fabrication of certain components of integral front seat frames for the new, low silhouette automobiles. By selecting Pacific Hydraulic Brakes and using progressive dies coupled with an automatic material feeding system, it became possible to form major components of seat frames at each stroke of press. In a one-man operation, the first press stamps and forms the rear rail . . . the major component of the seat frame . . . from 57½" width material automatically fed through a 9-station progressive die from the back of the press to the front. The second press with two 4-station dies flattens and forms the ends of tubular material used for front seat, split-backs. Hydraulic system holds ram momentarily at the work to distribute tonnage evenly as punches enter material. Pressings are noiseless and extremely accurate.

Pacific Hydraulic Brakes actually cost less than conventional presses for this work. Pacific is a versatile tool profitable for any plant, large or small. It pays for itself from operational savings in blanking, forming, deep drawing, embossing, punching, straightening, stretching, extruding, hot forming or shearing. There is a Pacific Hydraulic Press Brake of the correct size to suit your needs.

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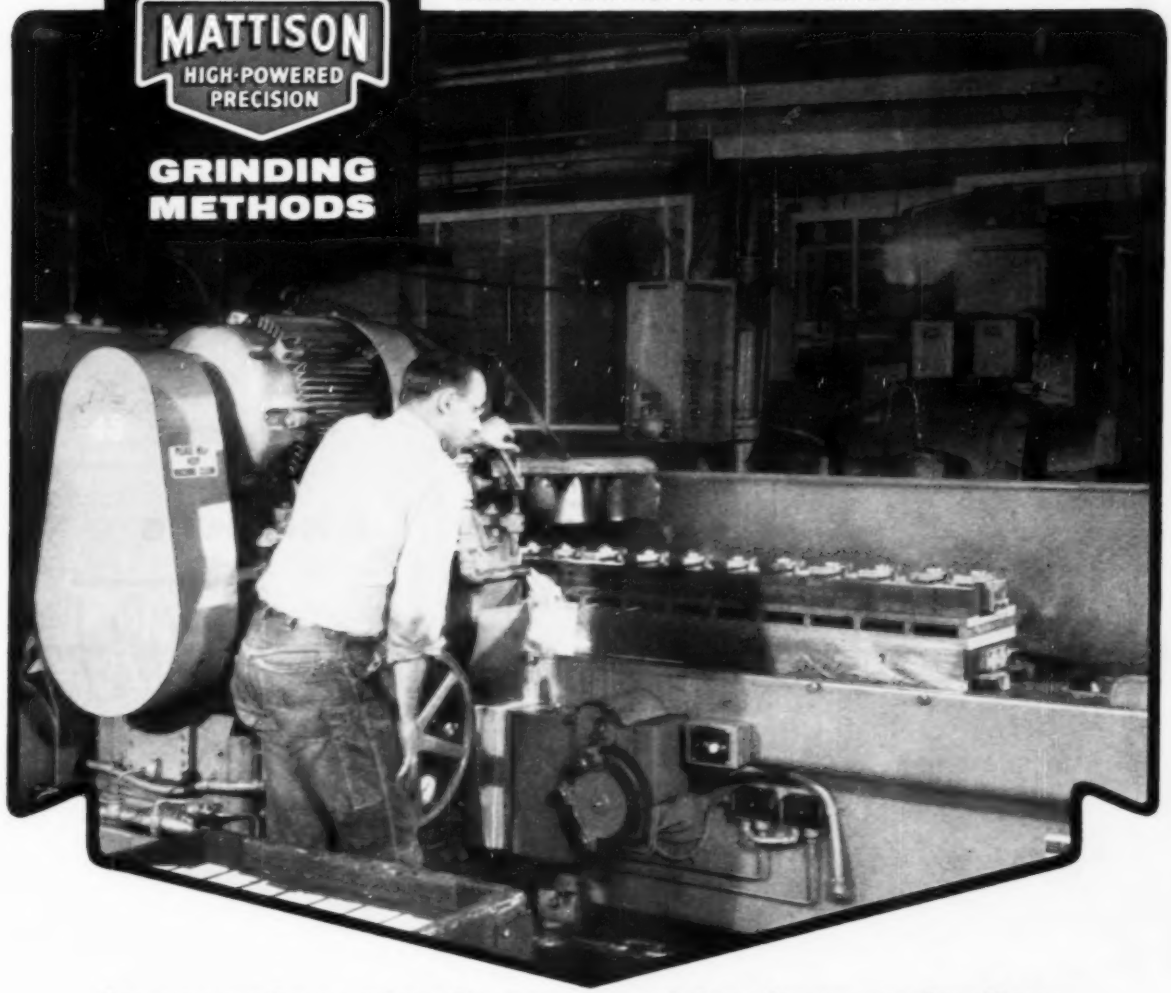
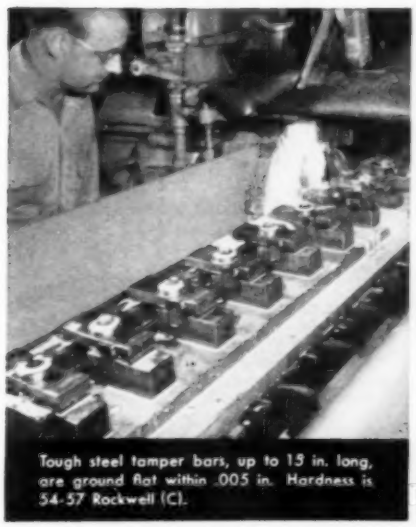
CASE HISTORY NO. 42—STEEL TAMPER BARS

MATTISON
HIGH-POWERED PRECISION
GRINDING METHODS



Increasing stock removal by face grinding boosts production 26%... rejects eliminated!



Tough steel tamper bars, up to 13 in. long, are ground flat within .005 in. Hardness is 54-57 Rockwell (C).

Greater contact area of the segmented wheel, backed up by rigidity and high horsepower of the Mattison No. 4000 hydraulic-feed face grinder, produced valuable production benefits in grinding tamper bars at the Barber-Greene Company, Aurora, Illinois.

The tough steel bars must be ground within .005 in. for flatness. Production officials of the company say: "Our grinder takes a good, deep cut out of the bars and does it speedily, without overheating." Time-study figures compiled over a three-month period show the following production gains over the old method: 19% increase grinding both ends; 29% increase grinding edges; and 30% increase grinding flats, an average of 26% gain in all operations on the "Mattison."

If you are doing a production machining job by milling, planing, shaping, or peripheral grinding, a Mattison face grinder or vertical spindle surface grinder probably can help you improve quality and reduce costs.

At Barber-Greene, for example, each of the wheel segments offers *ten square inches* of grinding surface in actual contact with the work, permitting high stock removal and efficient coolant distribution for fast grinding with minimum heat generation. Your Mattison dealer can arrange to have your parts test-ground in the Mattison Methods Laboratory

MATTISON
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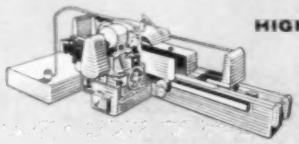

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The totally enclosed spindle and quill mounted on super-precision ball bearings, with quill moving in a solid bearing . . . the extra-wide base and reinforced column, both cast as a single unit . . . the wider bearing surfaces . . . all contribute to the Jigmaster's exceptional rigidity and accuracy.

Any one of three table and saddle locating devices may be used for hole location. All machine controls can be operated from a single convenient location.

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SPECIFICATIONS

Table Size	18" x 24"
Table Travel—Longitudinal	20"
—Cross	15"
Vertical Capacity	23"
Throat	20"
Weight	

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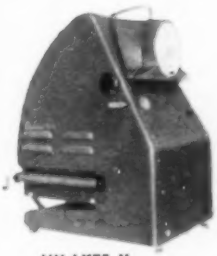
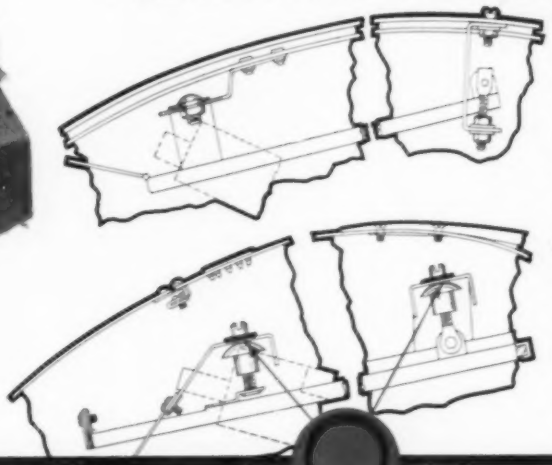
Waldes Truarc Rings cut assembly costs, improve performance of precision photo-optics equipment

Charles Beseler Co., E. Orange, N. J. uses Waldes Truarc Retaining Rings in 3 applications shown.

REFLECTING MIRROR ASSEMBLY IN OPAQUE PROJECTOR



VU-LYTE II PROJECTOR



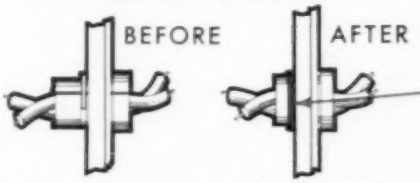
BEFORE

"The front surface mirror is the most precise optical element in a properly-functioning opaque projector," Beseler writes. "Previously we used this extremely cumbersome means of holding the mirror in position. As mirror adjustments are always required and the mirror is extremely delicate, our spoilage was terrific."

AFTER

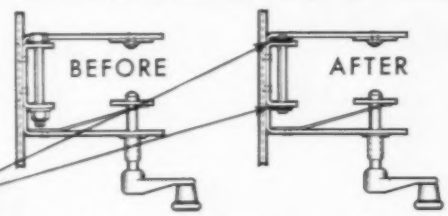
"Two Truarc Series 5100 Rings made possible complete redesign of the mirror assembly. Now mirrors can be adjusted from outside the projector. Rejects now are practically nil. More precise adjustment of the mirror is possible. And because of the greater ease in adjustment, we have cut labor costs $2.00 per unit."

HEAT ASSEMBLY IN PRINT DRIER



Here a Waldes Truarc crescent ring, Series 5103, replaced a split collar and clamping ring. Results: labor costs cut 50¢ per unit because of greater ease of assembly. Drier provides more uniform heating.

35 MM MICRO-FILM NEGATIVE CARRIER IN ENLARGER



2 Waldes Truarc Series 5133 E-Rings replaced 2 cap nuts—at a saving of 20¢ per unit in labor costs.

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WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.

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For quick modernization at a minimum cost, investigate the possibility of fitting Ceco-Drop upperworks to your present board drop anvils and foundations.

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PUNCH, STAMP, FORM

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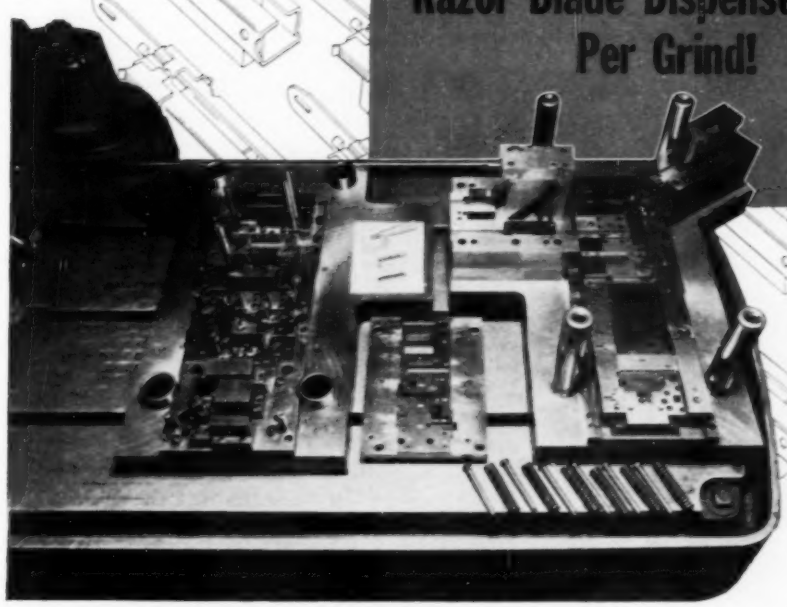
Razor Blade Dispenser Parts Per Grind!

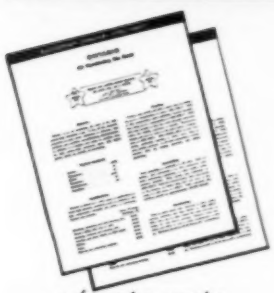


Punching, stamping and forming parts of this die are of air-hardening Allegheny Ludlum ONTARIO—heat treated to 61-62 Rockwell C. Slides, frames and cams are of A-L DEWARD oil-hardening die steel—heat treated to 61-62 Rockwell C.

Ontario sections were pre-heated to 1250 F, then heated to 1850 F, held at 1850 F for about an hour and a half, then quenched in still air to room temperature. Finally they were drawn at 350 F for about three hours.

Deward sections (slides, frames and cams), were pre-heated to about 1200 F, then raised to 1420 F. As soon as they were uniformly heated and equalized with the furnace temperature, they were quenched in warm oil. Sections were then tempered for two hours at 325 F.

Thus, two superior A-L steels combine to solve an intricate production problem. You, too, may have an application that will benefit from a better selection of tool or die steels. For complete information, call your nearest A-L distributor or representative today, or write *Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh, Pennsylvania.*



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These 4-page folders contain complete information on forging, annealing, tempering, etc., and detailed laboratory data on physical characteristics of A-L Deward and Ontario. *Ask for your free copy.*

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Reversible "Go" Gage member made of carefully selected steel and hardened by special Bath process.

Green nut locks "Go" Gage member securely in place.

Easy grip handle . . . hexagon shape prevents rolling.

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Here are 6 reasons why Ohio Knife Hardened Bedways are best for you

1. You buy consistent quality at a fixed cost, thus eliminating the uncertainties of producing bedways yourself. When you buy from Ohio Knife you can depend on bedway accuracy, prompt delivery and exact costs.

2. OK ways are so hard they're practically wear-proof, which helps maintain constant accuracy throughout the life of the machine. This extreme hardness, 65-66 Rockwell "C", is uniform to 3/16" depth. The Gisholt Machine Co. demonstrated OK bedway hardness by taking a section from the way, making it into a tool bit, and cutting 1045 cold-rolled steel with it.

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4. A complete selection of bedway shapes, sizes and lengths is available to you. OK ways can be built to your specifications for any application.

5. Ohio Knife hardened bedways are so well known for their high quality that many machine buyers look for and favor machine tools built with OK ways. So to gain a big sales point, make sure you use OK bedways.

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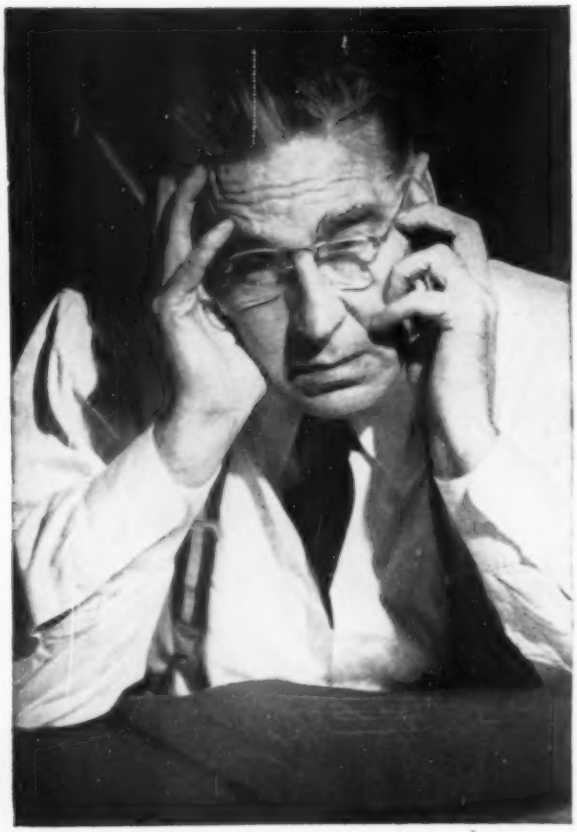

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COUNTERSINKS and DEBURRING TOOLS

60°-82°-90°-100° ANGLES

CHATTERLESS

These tools include cutting diameters ranging from 1/64" to 3".

Greater ease in cutting and longer life are the outstanding features of these WELDON tools for countersinking and deburring operations. Chatter is eliminated because of the single cutting edge. One trial will convince you.

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technite® high speed steel

band sawing case history

CAPEWELL PRODUCTS
Carbon and High Speed Steel Band Saws, Hand and Power Hack Saws, Hole Saws, Pipe Fitters' Hand Tools, Hammers, Ground Flat Tool Steel, Foundry Chill Nails.

THE USER: Dynamatic Division Eaton Manufacturing Co., Kenosha, Wisc.

THE MATERIAL: #1020 cold roll 5½" stock.

THE JOB: Accurately cut blanks for dynamometer part.

THE PROBLEM: Uneven cuts, low speed, short blade life.

THE ANSWER: TECHNITE High Speed Steel Band Saw Blade.

THE RESULT: Extreme accuracy, fast cutting, and long blade life.

This case history is but one of many which illustrate the advantages of Capewell Technite Bands. Available in regular, skip or shark tooth design, these precision band tools are furnished welded and cut to length for recommended machines only. The Capewell Sales Engineer in your area will be glad to discuss cutting applications which will enable you to increase substantially your cutting accuracy and speed.

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The Capewell Manufacturing Company
Hartford 2, Connecticut

I am interested in Technite High Speed Steel Band Saw Blades.

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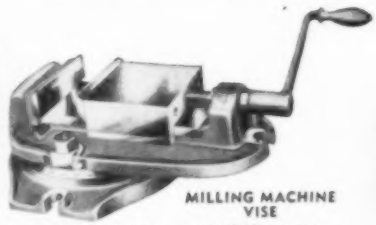
Bridgeport offers long-time economy and wide-range versatility on a moderate investment

Tool rooms, die shops and production lines are making **BRIDGEPORT TURRET MILLING MACHINES** a **"MUST"** today. Economy, speed, accuracy and ease of handling are some of the reasons for the ever widening acceptance of the **BRIDGEPORT**, recognized everywhere as the "greatest value in the machine tool market".

To these reasons must be added that of outstanding versatility provided by **BRIDGEPORT** attachments, a few of which are shown here. Any of these attachments may be purchased at any time . . . with the machine itself or added later when needed.

Thus the basic purpose of the **BRIDGEPORT** for milling, drilling, boring and shaping may easily be extended to include such operations as cherrying, right angle milling as well as copying.

Precision in manufacture and sturdiness of construction assure the economy of the **BRIDGEPORT** for many years to come. Investigate **NOW**.



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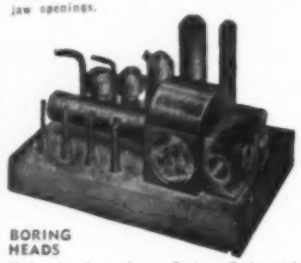
Improved and providing great gripping power, with large diameter screw for rigid holding. Streamlined for appearance and equipped with coolant trough. Two sizes: 5" x 3½" and 6" x 5" jaw openings.

RIGHT ANGLE ATTACHMENTS

Heavy Duty (shown above) for milling and drilling at right angles . . . fits both Master and ¾ HP heads. Also Light Duty for right angle drilling of deep molds and cavities . . . fits Master Head only.

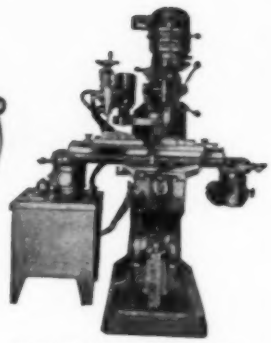


BORING HEADS

Made in two sizes. Boring Tools and Holder provide means for boring holes up to 6" diameter; available for use on Bridgeport ¾ HP Milling, Drilling and Boring Attachment.

CHERRYING ATTACHMENT

Makes possible production of convex and concave shapes; ideal for producing drop forge dies, molds, cavities.



TRUE TRACE COMBINATION

The Bridgeport True Trace Combination gives excellent performance and saves endless hours when copying irregular dies and molds.

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Bridgeport MACHINES, INC.

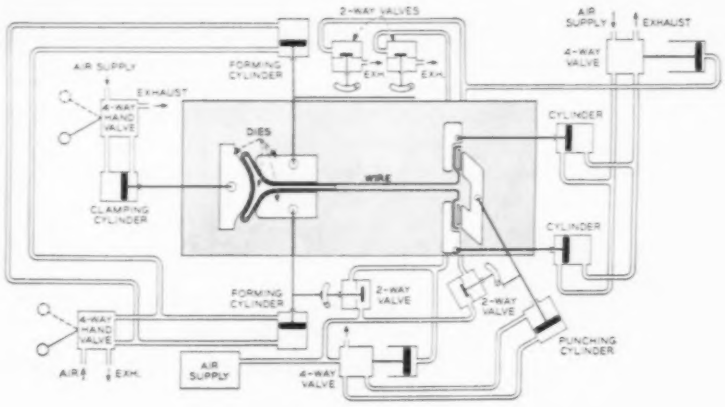
Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

***Progress** in plan-it-yourself air systems:*

How one plant cuts forming costs 75% with Schrader Air Products adapted to jig

Outdoor grill legs formed. Operator places wire between dies. Note Schrader products. Schematic below gives Schrader "Air layout" at end of cycle with wire formed.



Before this Schrader-powered forming jig was installed, an Ohio plant used heavy punch press equipment and costly welding procedures. Now man-hours and materials have been released for other work, and a single operator produces the finished part in seconds, effortlessly. Cutting the cost of the finished product by ¾!!

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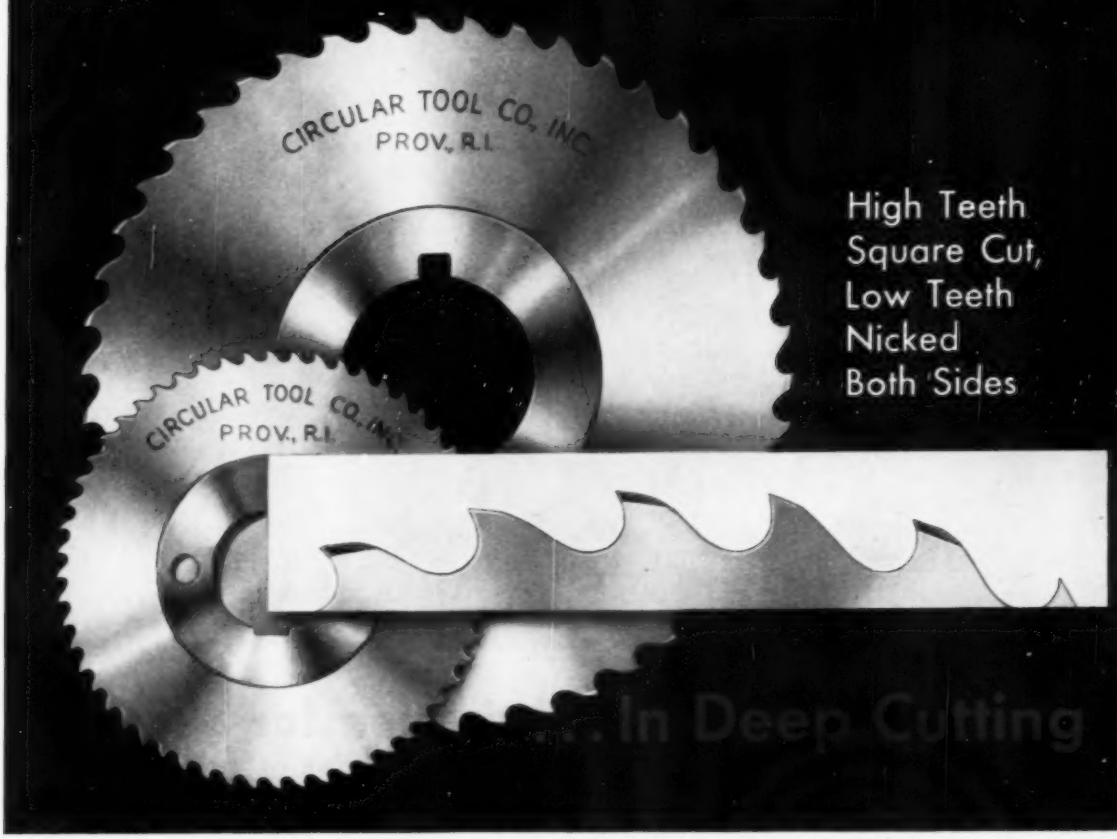

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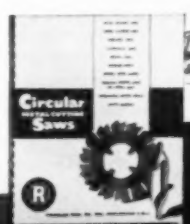

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DoALL users say Band Sawing is the fastest, lowest cost CUT-OFF Method!

Typical blanks and parts cut-off with the DoALL Automatic Power Saw, showing unlimited range of this versatile band machine.

Mr. Paul Zellers (left) is Maint. Supt. of the Clifford-Jacobs Forging Co., Champaign, Ill. His cut-off department sets the pace for the company's forging operation which must turn out an unusually wide range of jobs 24 hours a day, seven days a week! This challenge to the cutting-off operations is met by two automatic DoALL Power Saws that are giving phenomenal performance: "We increased production 200% on multiple billet cutting . . . We get up to 15,000 sq. in. blade life cutting 1040 type billets . . . 100% savings in waste metal . . . No down time for maintenance."

WHAT OTHER USERS SAY . . .

"The ability of the DoALL Power Saw to cut 4½" round oxygen-free copper within .005" and in less than two minutes per cut more than proved its worth . . ."—*L. Cavelier, Concord, Mass.*

". . . In the 19 months since we bought our DoALL Power Saw, we have used only 31 saw bands, which we feel is quite remarkable inasmuch as the machine has been used almost continuously—24 hours a day."—*Southwest Ornamental Iron Co., Kansas City, Mo.*

". . . we find we can hold our stock for finishing at a minimum as the saw cuts are accurate within a few thousandths."—*The Independent Machine Co., Cuyahoga Falls, Ohio*

"Since we have installed two new DoALL Power Cut-Off Saws equipped with Demon High-Speed Saw Blades, our production has increased from 200% to 300%."—*The Ridge Tool Co., Elyria, Ohio*

"Savings on material alone over the old method pays for the blades."—*Beaver Pipe Tools, Inc., Warren, Ohio*

"Blade life on alloy steels has averaged close to 5000 sq. in., and on HSS better than 6000 sq. in. Maintenance costs have been practically nil."—*Goddard & Goddard Co., Detroit, Mich.*

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3. **DoALL TOOL COST**—Demon High-Speed Steel Blade lasts up to 30 times longer than carbon steel blades—keeps tool costs low!
4. **DoALL MATERIAL SAVINGS**—thin blade (only 1/16" wide) cuts narrow kerf, giving you substantial "material saved" bonus with every cut!
5. **DoALL MACHINE INVESTMENT**—less than power hacksaws and cold saws of comparable capacity!

Model C-58 HIGH PRODUCTION

Power Saw, Automatic Stock feed indexing. (12" x 12" capacity.)

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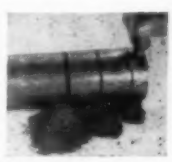
The thin Demon *High-Speed Steel* Blade (only 1/16" wide) reduces your material waste—gives you a substantial "material saved" bonus that mounts with every cut.



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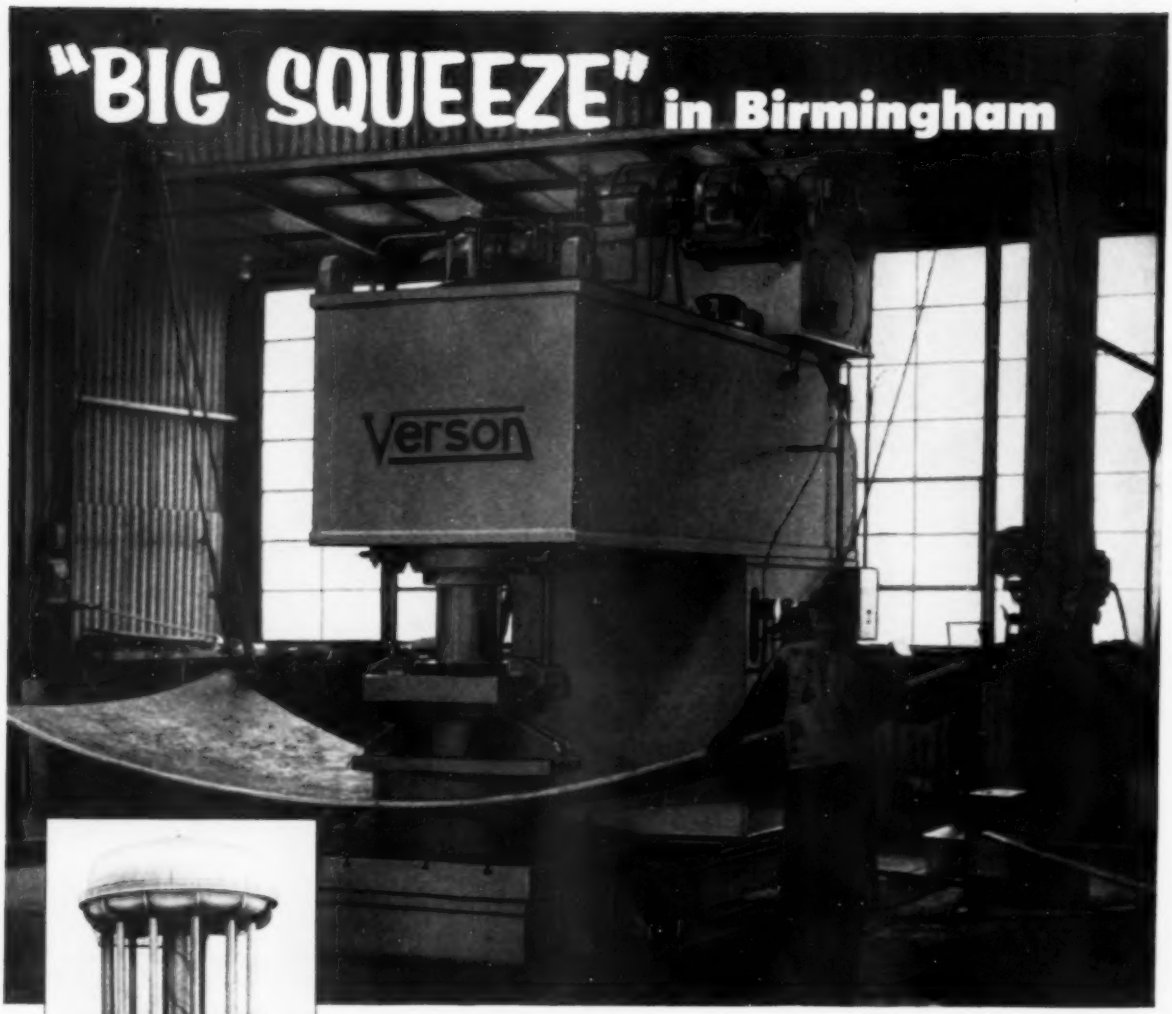

200 ton Verson Press dishes steel plate for storage tanks at Hammond Iron Works

Do you put the "Big Squeeze" on metal? Here's how Hammond Iron Works does it at their Birmingham, Alabama, plant. This recently installed 200 ton Verson Hydraulic Flanging Press dishes heavy steel plate for the wide variety of storage tanks manufactured by Hammond.

Gap depth is 72" (from centerline of cylinders to back of frame), more than ample for a work piece such as this section for a radial cone elevated water tank. The press has a fast advance speed of 388" per minute; pressing speed, 38" per minute; and fast return speed, 520" per minute.

The down-acting cylinder has a 36" stroke; the bed liftout cylinder, a stroke of 18". Ram area is 30" x 30" and the bolster is 60" x 60".

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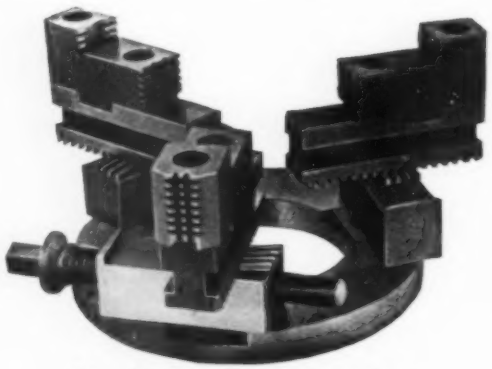

Internal working parts of the Forkardt chuck

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- No bevel gears
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- All operating parts made of Nitroloy steel, hardened, ground
- Higher resistance to wear and tear, and hence
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- Interchangeable jaws
- Two piece jaws with reversible tops

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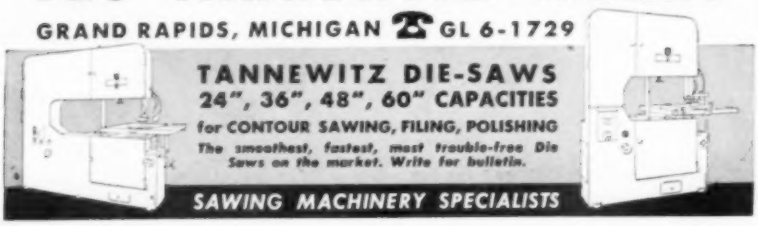

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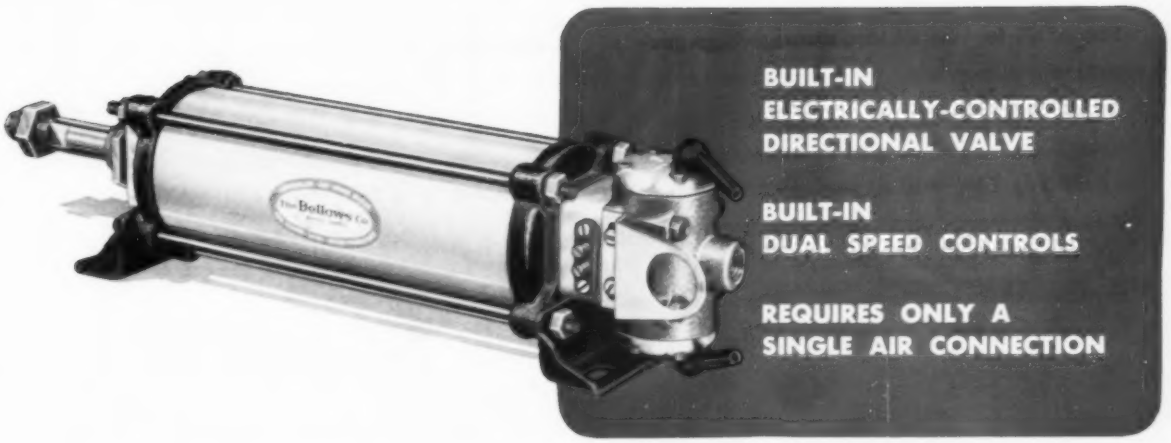

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REQUIRES ONLY A SINGLE AIR CONNECTION

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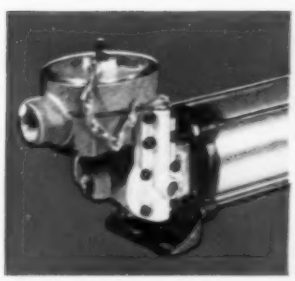
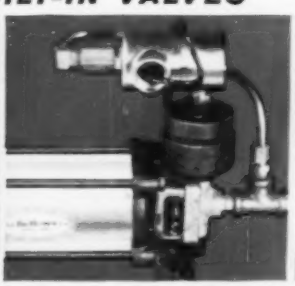
The Bellows Air Motor is a complete air cylinder power unit, with directional valve and speed controls built-in. Takes less than half the space and costs less installed than a conventional air cylinder set-up of equal power with its separate valving and piping. The single air connection, which can be made with flexible hose, makes it ideal for use on moving machine elements. It is a sturdy unit with forged steel heads, heavy brass cylinder, stainless steel piston rod. The piston rod is threaded, equipped with a wrench flat and nut. Many Bellows Air Motors have been operating day in and day out for fifteen years with negligible maintenance. And if service needs do arise, there is a Bellows Field engineer as near as your phone. The Bellows Air Motor shown above is a 2½" bore unit equipped with the Bellows Low-Voltage (8-12V) Electroaire Valve. Other bores available are 1¼", 1¾", 3⅝" and 4½". Any stroke length. Optional choice of built-in valves as shown below.

CHOICE OF BUILT-IN VALVES

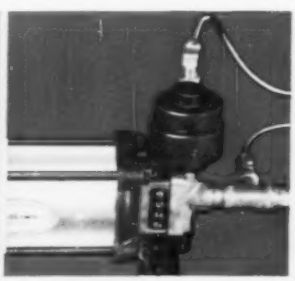


115 V. ELECTROAIRE VALVE
For J.I.C. applications where a 115 v. momentary contact is desirable.

MECHANICAL VALVE
For manual operation or for use with cams or direct linkage.



115 V. MAINTAINED CONTACT
Valve remains in shifted position during period current is applied.



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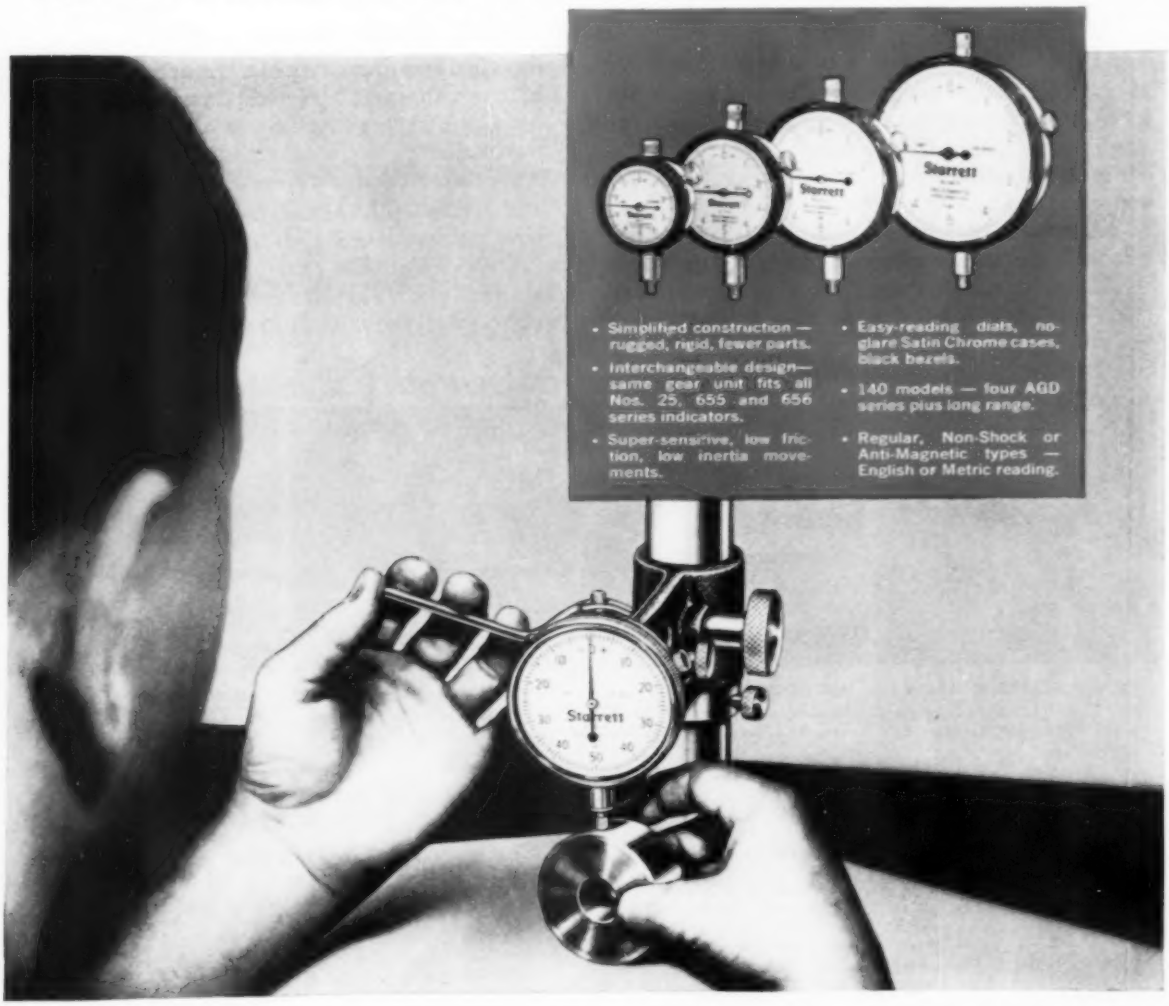
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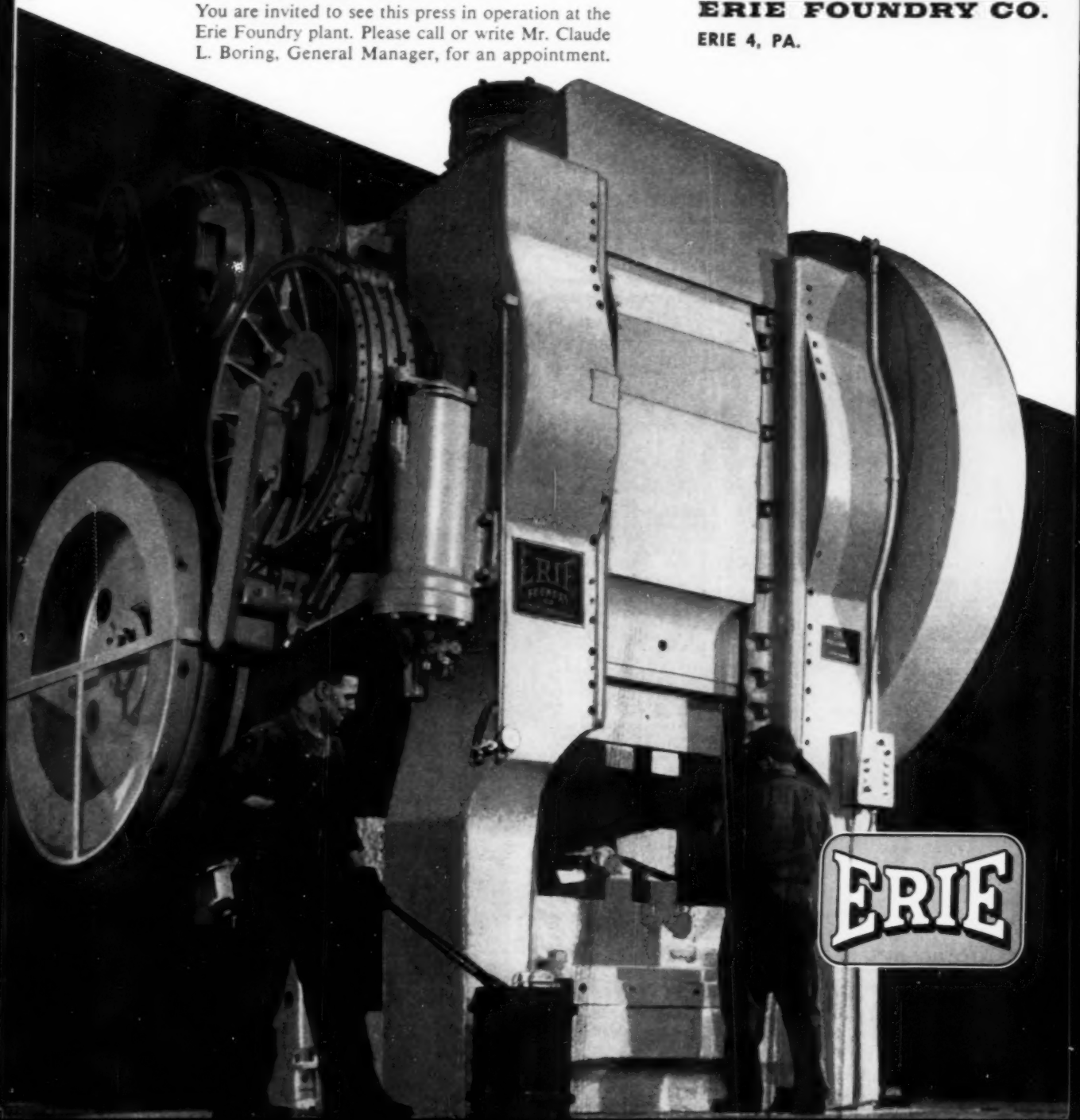
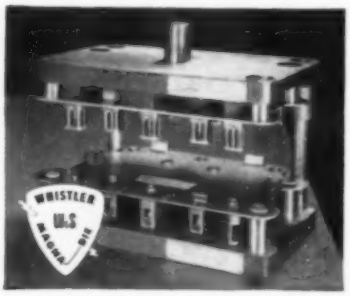
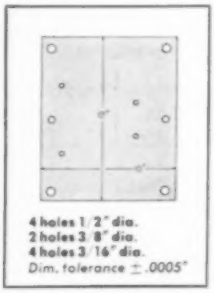


WHISTLER MAGNA-DIES
open the way to big savings

Over $2500 saved on these four typical jobs... Here's a specific example showing how Whistler Magnetic Perforating Dies are used and re-used to push die costs down to a rock bottom low:

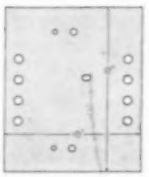




4 holes 1/2" dia.
2 holes 3/8" dia.
4 holes 3/16" dia.
Dim. tolerance ±.0005"

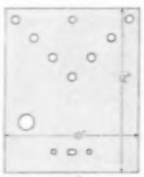
$106 SAVED ON JOB NO. 1...EVEN INITIAL INVESTMENT IS LESS

This Whistler Magna-Die unit includes a 12" x 14" die set, 10 punch and 10 die retainers, 10 punches, 10 die bushings, 10 strippers, 3 gages and one set of templets. The complete price with templets jig bored and gages mounted for producing the 10-hole part shown above: $819.00. The approximate cost of a custom die to do the same job: $925.00. From the very start, you start to save with a Whistler Magna-Die.



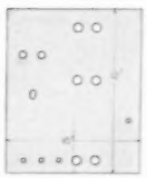
8 holes 1/2" dia.
2 holes 3/8" dia.
2 holes 3/16" dia.
1 oval hole 3/8" x 1/2"
Dim. tolerance ±.0005"

$710 SAVED ON JOB NO. 2. All of the original punch and die parts (with the exception of 2 punches, 2 bushings and 2 strippers) are re-used here. The additional tooling required, plus bored templets with gages mounted, cost $389.79. The approximate cost of a custom die to produce this part: $1100. *Savings pile up with each succeeding job...$816 so far.*



1 hole 31/32" dia.
7 holes 1/2" dia.
1 hole 3/8" dia.
2 holes 3/16" dia.
1 oval hole 3/8" x 1/2"
Dim. tolerance ±.0005"

$793 SAVED ON JOB NO. 3. Through the use of another punch and die retainer unit, a 31/32" punch, die bushing and stripper plus a new set of bored templets with gages, this part is produced at a die cost of $246.81. In this case, the cost of a custom die would amount to approximately $1040.00. *Savings now reach $1609.*



6 holes 1/2" dia.
2 holes 3/8" dia.
4 holes 3/16" dia.
1 oval hole 3/8" x 1/2"
Dim. tolerance ±.0005"

$925 SAVED ON JOB NO. 4. As more Whistler punch and die parts are accumulated, die costs for each succeeding job usually go down even further. Here, for example, only a new set of templets, jig bored to the 13-hole pattern, is needed. The cost: $163.55. A custom die for this job would run approximately $1089.00. Total savings for these first four jobs alone amount to approx. $2535.

EACH JOB CAN BE RE-RUN AT ADDED SAVINGS, TOO!

Punch and die parts can be quickly re-assembled to re-run any one of these four jobs. All it takes is approximately 10 minutes for press changeover. Whistler Magna-Dies cut downtime and remove production bottlenecks by avoiding the extra time required to obtain custom dies. They can be used on practically any press with a minimum shut height of 9 1/2" for perforating materials up to and including 1/4" mild steel.

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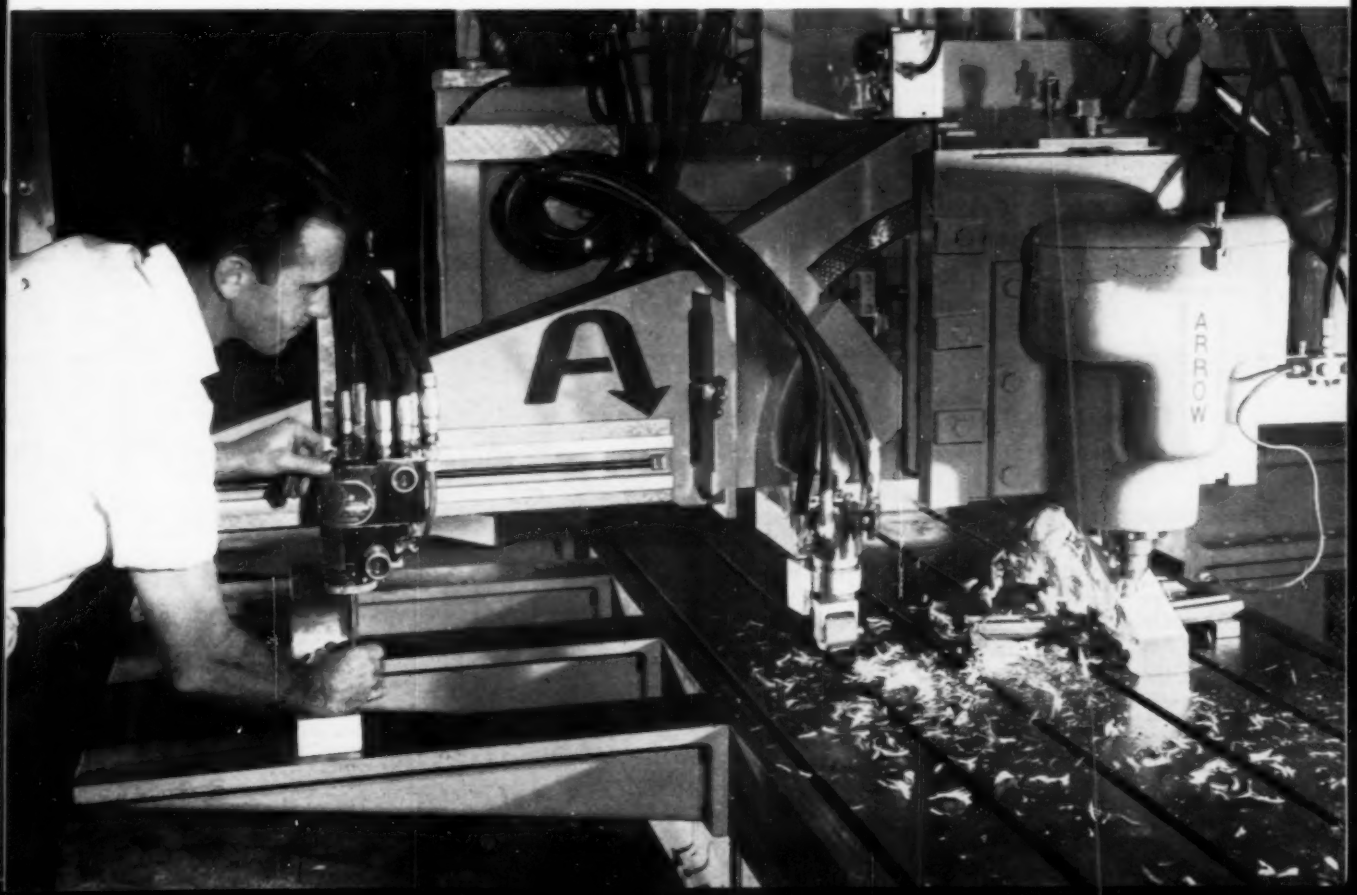
ARROW ENGINEERING COMPANY, INC. *1523 Oliver Avenue, Indianapolis 21, Indiana*



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Four 10"x40" POWER-GRIP Chucks on a 24"x96" horizontal spindle surface grinder hold ways, way caps, valve plates, broach holders etc. The four chucks can be operated individually or as one complete unit. Set-up time averages 20% less than previous method.

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Bulletin 187-M

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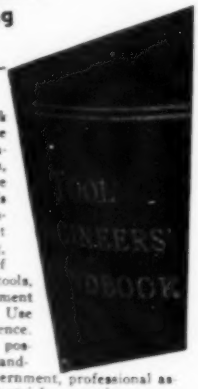

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American Society of Tool Engineers
Frank W. Wilson, Editor-in-Chief

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A small selection of highlights selected at random to illustrate the scope of this Handbook:

- Describes types of machines, cutting tools, tool holders, fixtures and operations in precision production boring.
- Includes all new techniques and processes of recognized acceptance including Powder Metallurgy, Investment Casting, Plastic Joining of Materials, etc.
- Conventional tables of feeds, speeds and cuts modernized to bring them into line with latest cutting tool materials and cutting practices.
- Treats, process-wise, such topics as Plaster Mold Casting, Superfinishing, Rotary Swaging, Sheet and strip cold roll forming, Die Hobbing, etc.
- Covers every phase of metal cutting and machinability.
- Discusses welding, gluing and mechanical joining of materials.

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National distribution of Olivetti sensitive drill presses, cylindrical grinders, production milling machines, automatic boring machines, and units for automation is being established throughout the U.S. Olivetti has been making quality machine tools for over 30 years. For sales, service or information, call or write Olivetti Corporation of America, Machine Tool Division, 42-32 Northern Boulevard, Long Island City, N.Y.

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Model T6-b (shown above) has 7/32" capacity, 8 speeds up to 12,000 r.p.m. Other models: T12, 15/32" capacity; T18, 11/16" capacity.

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Without Burn or Heat-Check
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With Accuracy & Fine Finish

as pictured here...at cutting speeds of 6 to 10 seconds per square inch of High-Temperature Metals or Heat-Sensitive Tool Steels.

Real economy in costly material results from straight cut, closer tolerance, small kerf loss on CAMPBELL abrasive cutting machines. (1/32" less waste per cut on a 6" bar of titanium saves about $1.50 per cut!)

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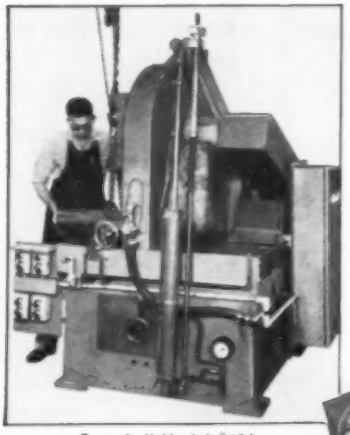

Campbell Model #481
wet, abrasive cutting machine. Capacity up to 8" square solids and 8" O.D. tubing.

May we send you a copy of Bulletin DH-460-B? It gives complete data on 15 Campbell Machine Models

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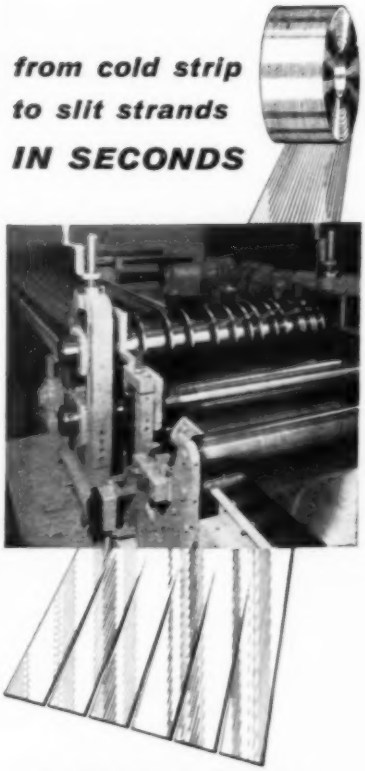
BE sure your machine tools don't spend most of their "working" day as layout tables. A machine tool earns its keep only when it is cutting metal. Jobs can be set up on a surface plate or bench by someone else—frequently someone better at setup than the machine operator.

from cold strip to slit strands IN SECONDS



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A Yoder slitter converts mill-width coils of flat-rolled metal into many variable-width strands in amazingly short time. Speed, coupled with great accuracy and low manpower requirements, makes a Yoder slitter an important factor in keeping production and overhead costs down.

Operated by only two men, the Yoder Type 3-48 slitter illustrated is designed to accommodate standard mill-width coils up to 48 inches wide, in a variety of metals and thicknesses. The slit strand widths can be held to within a .004" tolerance.

Even if your steel requirements are as little as 100 tons a month, the savings to be realized in time, manpower and raw material costs alone will pay for a Yoder slitter in the first few months of operation.

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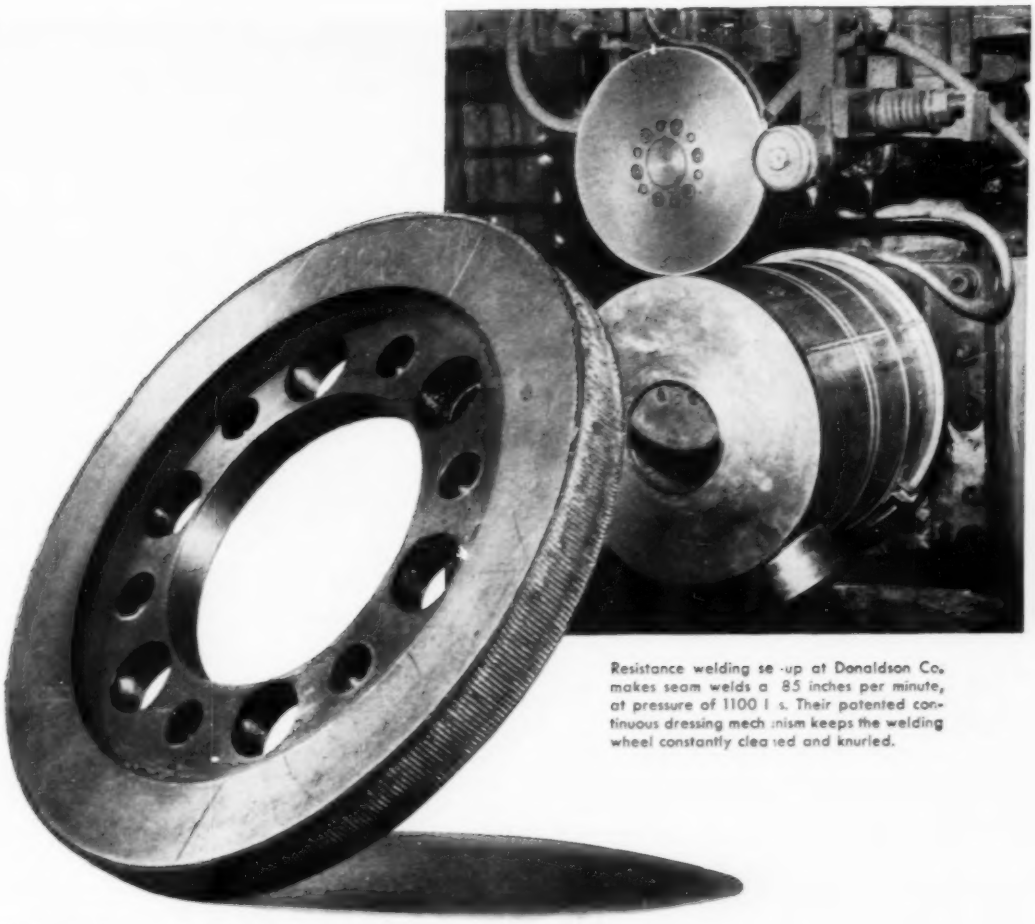

Resistance welding se -up at Donaldson Co. makes seam welds a 85 inches per minute, at pressure of 1100 l s. Their patented continuous dressing mech :nism keeps the welding wheel constantly clea ied and knurled.

Half a Million Feet of Seam... Welded by This Mallory Wheel

How long do Mallory seam welding wheels last? Here's an example.

At the Donaldson Company, St. Paul, Minnesota, the Mallory 22 seam welding wheel shown above has just been retired after making about 500,000 feet of $\frac{1}{8}$" lap mesh weld on the body sections of big internal combustion engine air cleaners. This service, according to Donaldson, is 3.2 times the life that they used to get with ordinary seam welding wheels.

Several reasons are behind the long life of Mallory wheels. Specialized alloys go into them, developed by Mallory during more than 30 years of leadership in resistance welding. Equally important is the extreme hardness and wearing ability that Mallory adds to these alloys. The result—more welds, better welds, per dollar.

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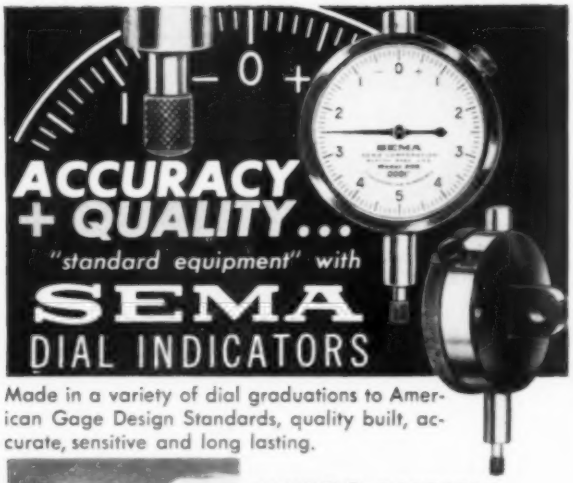

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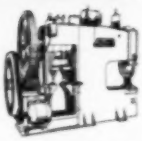

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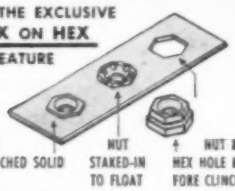

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Sciaky Techniques Permit Adaptation of Standard Equipment to Automated Production

Automated seam welding is another Sciaky Resistance Welding Technique that can improve profit potential. And, the adaptation of *standard* equipment means that now profits increase faster because no huge expenditures are required for constructing "special" welders.

For example, the largest independent manufacturer of transformers in the world, Moloney Electric Co., St. Louis, Mo., automated the seam welding operations for their distribution transformer tanks by merely adding an automatic positioning fixture to a *standard* Sciaky Patented Three-Phase Resistance Welder.

Welding cooling fins to the tanks was originally a slow, costly arc welding job, and only one "L" shaped fin could be fastened at a time. Production requirements increased and fusion welding costs became prohibitive. As a result two standard Sciaky Longitudinal Seam Welders were installed to weld fins in "U" shaped pairs. Thus, Sciaky Resistance Welding Techniques increased production, and also improved tank design. Manual positioning of tanks and fins was adequate to meet production requirements at that time.

FIG. 2 After first weld cycle begins, electrode wheels progress down first fin as tank automatically indexes into throat of the welder. The tank then indexes radially for insertion of second fin, which is welded in position on return stroke of the tank back out of throat of the welder.

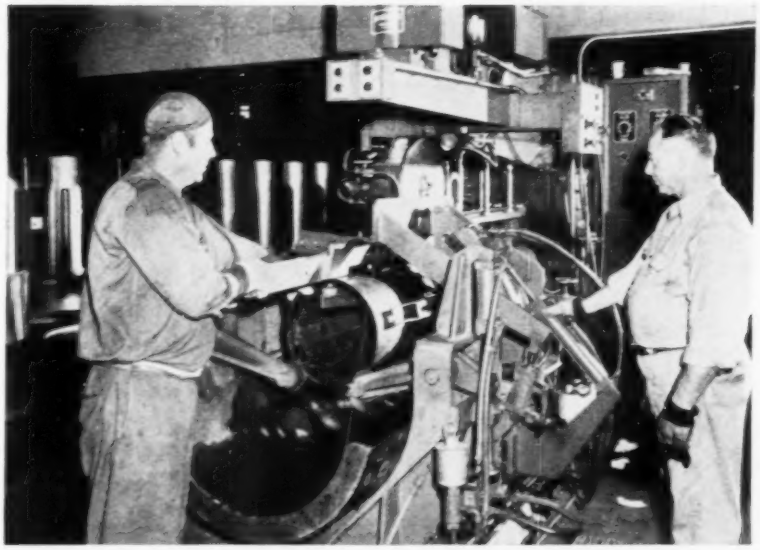

FIG. 1 After tank is loaded in automatic fixture, operator inserts first pair of "U" shaped fins in welding position. (Two brackets mounted on side of tank were joined in previous projection welding operations.)

Then, because of constantly rising materials and labor costs, Moloney faced the same "sliding profits" problem that confronts every manufacturer today. A research program was initiated to determine how to cut costs and improve manufacturing methods. This led them to study simple *automation* of the cooling fin and tank assembly operations.

Automatic Positioning Fixture

Sciaky engineers helped solve the problem with the new Sciaky Longitudinal Seam Welder equipped with special automatic fixturing. This automatic positioning fixture provides continuous, fool-proof seam welding of the cooling fins. A simple adjustment permits immediate change-over for various tank sizes, as well as radial spacing of fins.

This is how the *standard* Sciaky welder with automatic positioning fixture cuts manufacturing costs and increases production—all three operations are performed in one cycle . . .

(1) The machine welds one pair of cooling fins to the tank as it indexes into throat of welder.
(2) Positioner then indexes tank radially for the next seam welding operation.
(3) On return stroke, the machine seam welds the second fin.

Results

The Sciaky Patented Three-Phase Resistance Welder with automatic positioning fixture and two operators DOUBLED production over the previous method when two welders and four operators were required. The two previous machines and the extra two men were absorbed into other resistance welding operations.

Information Available

Case histories outlining the successful use of Sciaky Resistance Welding Techniques are available on request. Specific recommendations will be furnished on receipt of an outline of your requirements.

Write today, mentioning the information you would like to receive. No obligation. Sciaky Bros., Inc., 4933 W. 67th St., Chicago 38, Illinois. POrtsmouth 7-5600. 63D

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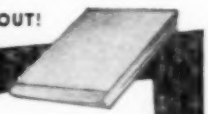

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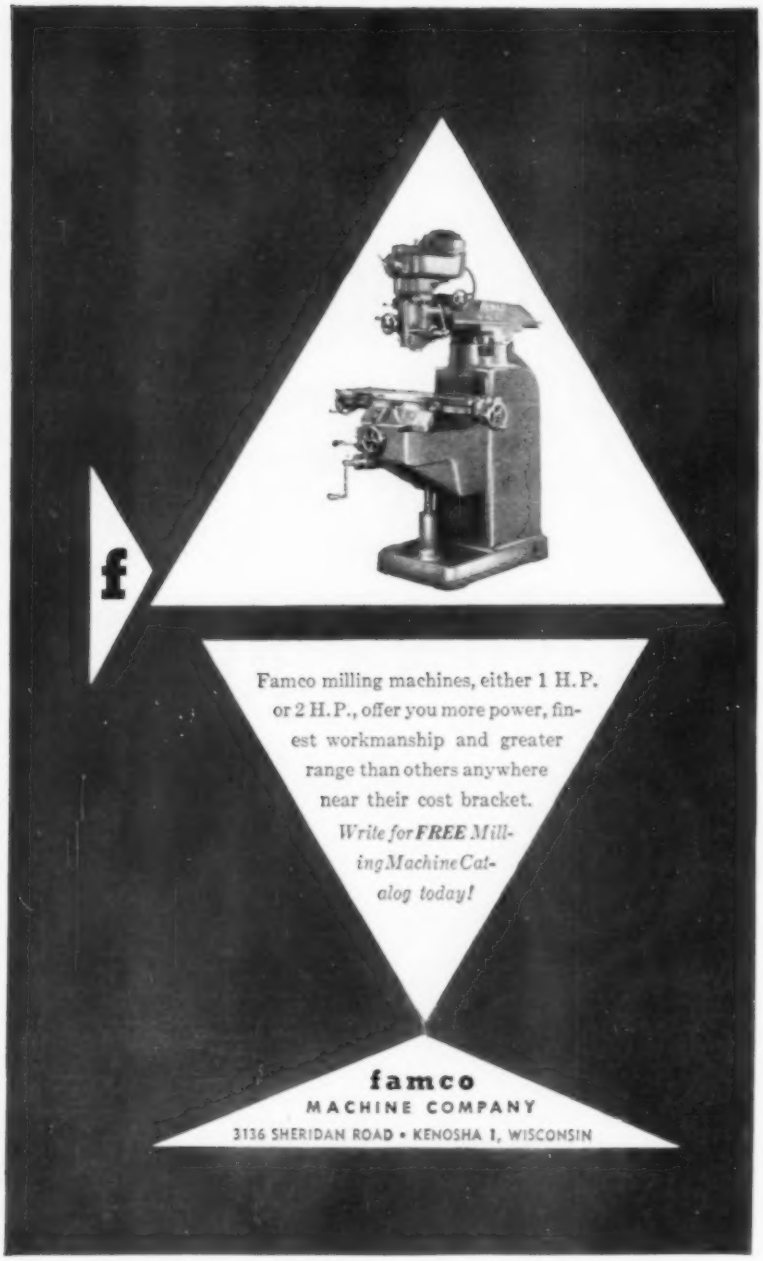

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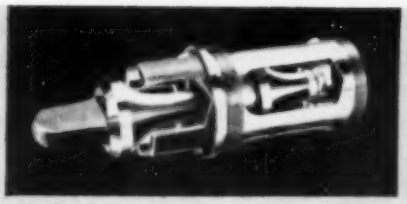
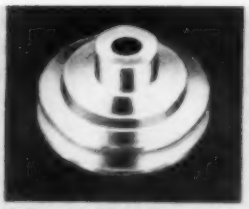
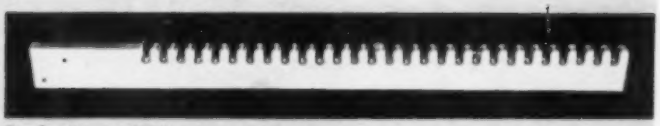


10% faster
Carpenter No. 5



Rejects down 25%
Carpenter No. 5



Production up 25%
Carpenter No. 5

18% more production
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5 to 10% faster
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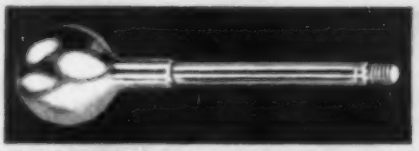

10% fewer rejects
Carpenter No. 8

Machining cost cut 50%
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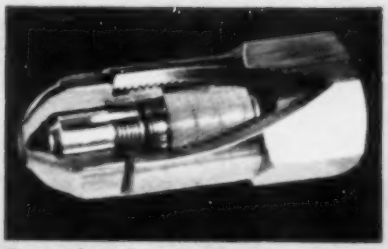

Rejects down from 10% to ½%
Carpenter No. 5-F

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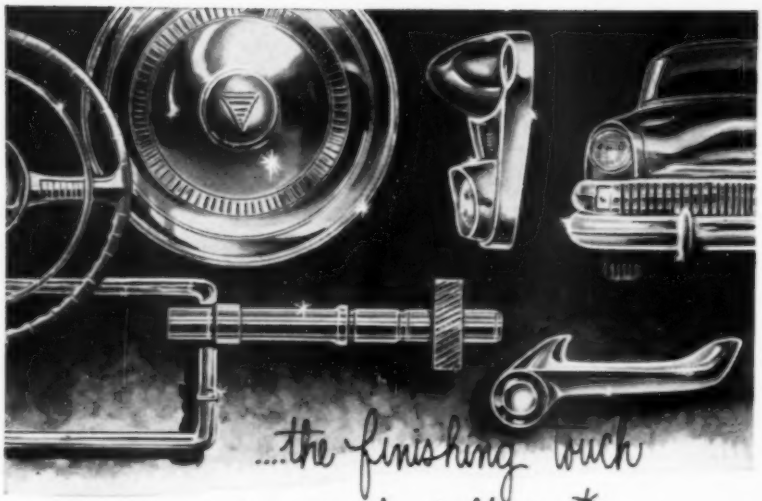

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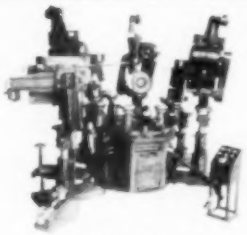

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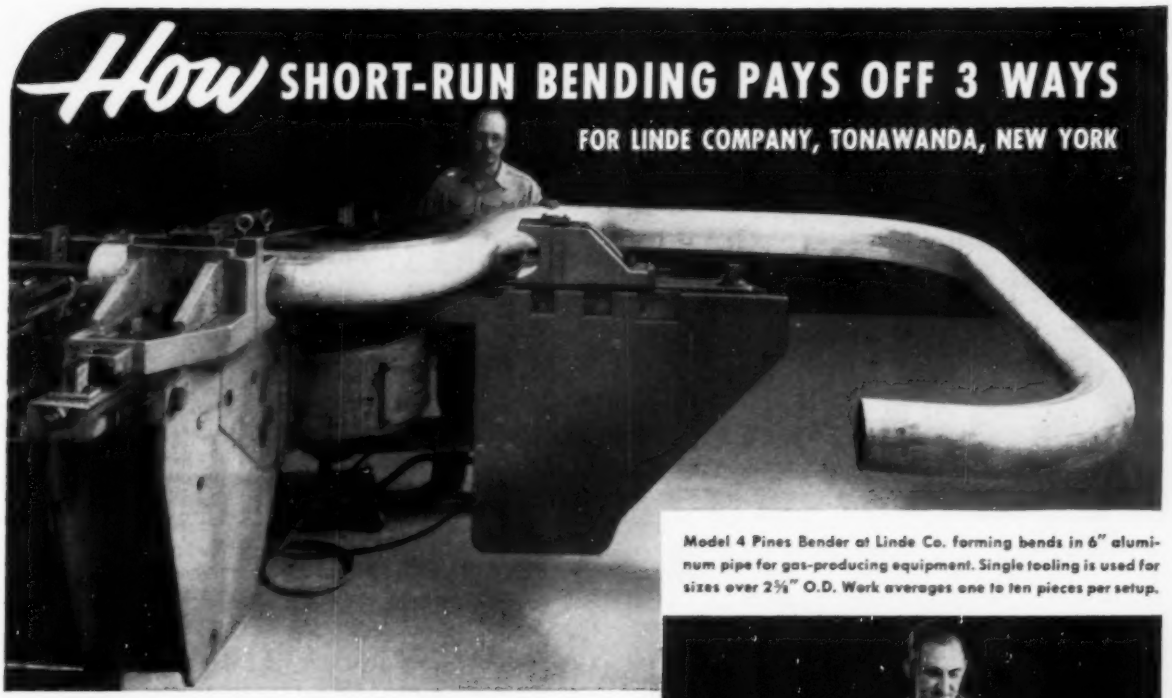
How SHORT-RUN BENDING PAYS OFF 3 WAYS

FOR LINDE COMPANY, TONAWANDA, NEW YORK



Model 4 Pines Bender at Linde Co. forming bends in 6" aluminum pipe for gas-producing equipment. Single tooling is used for sizes over 2⅝" O.D. Work averages one to ten pieces per setup.

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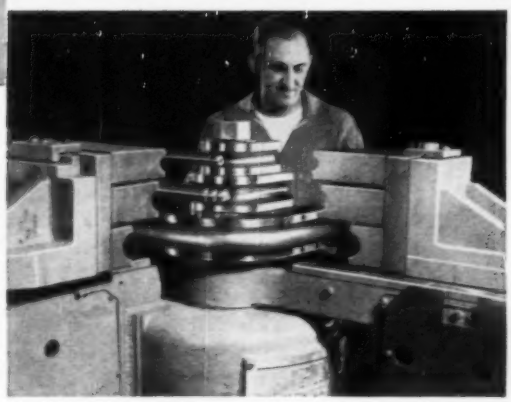

View of stacked die tooling which permits individual bending of three different tube sizes (1⅝", 2⅛", 2⅝" O.D.) without tool changes. Simple machine settings handle different angle requirements.

Multiple Dies Minimize Setup Time

As illustrated, for work up to 2⅝" O.D., a number of multiple stacked dies are employed which substantially reduce setup time. Tools are designed for interchangeability between the Model 2 and Model 4 machines. This permits handling as many as seven different tube sizes without a tool change. The ability to handle different bend angles that a given job may require by simple settings on the machines, contributes also to the efficiency the Linde Company has achieved in handling their requirements.

Over-all view of Model 4 machine equipped with three mandrels and stacked dies. Selection of standard radii also minimizes tooling and setup requirements over a wide range of sizes.

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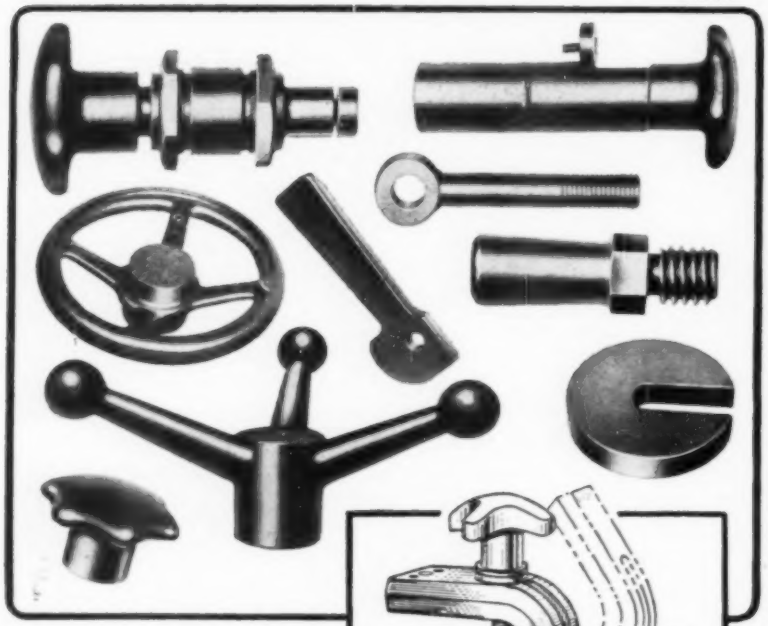

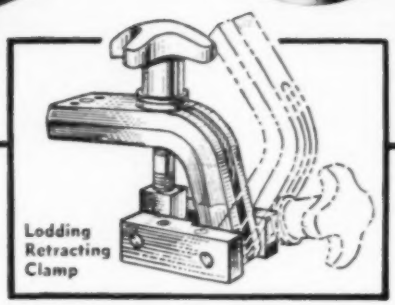

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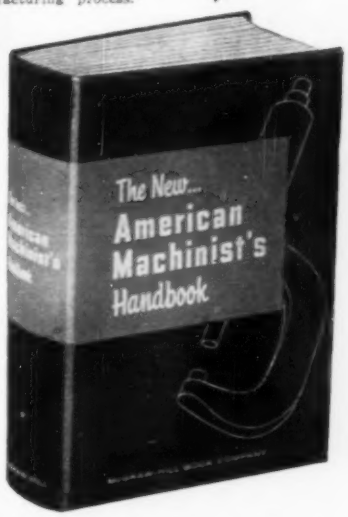

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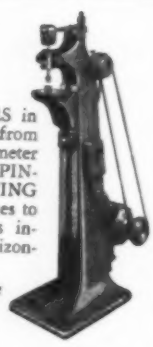

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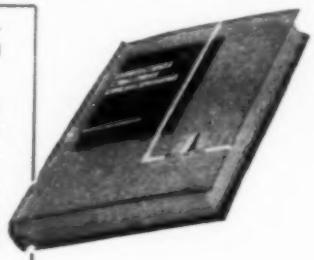

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No. H3 Niagara Horn Press, single back gear
No. 56-S-64 Minster Straight Side Double Crank Single Geared Press, belt drive
No. 164½ Toledo Toggle Drawing & Deep Stamping
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100 ton Chambersburg, Hydraulic
Type S750 Hennifin Hydraulic Straightening
Model H Cleveland O.B.I. Punch Press, belt drive

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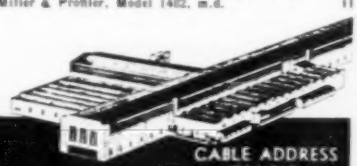

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NORTON Cyl. Grinder, 6x18 Plunge 1944
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No. 34-36, 45-48, 48" Cincinnati Duplex Mills, Late Type.

No. 2HL KEARNEY & TRECKER Horiz. Mill, M.D., Late Type.

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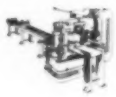

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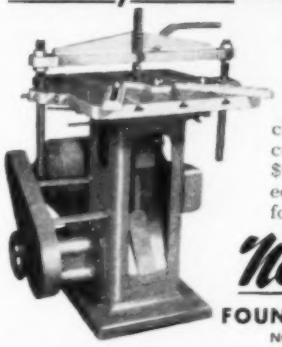
Northfield KEYSEATER



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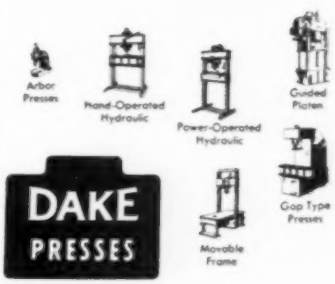

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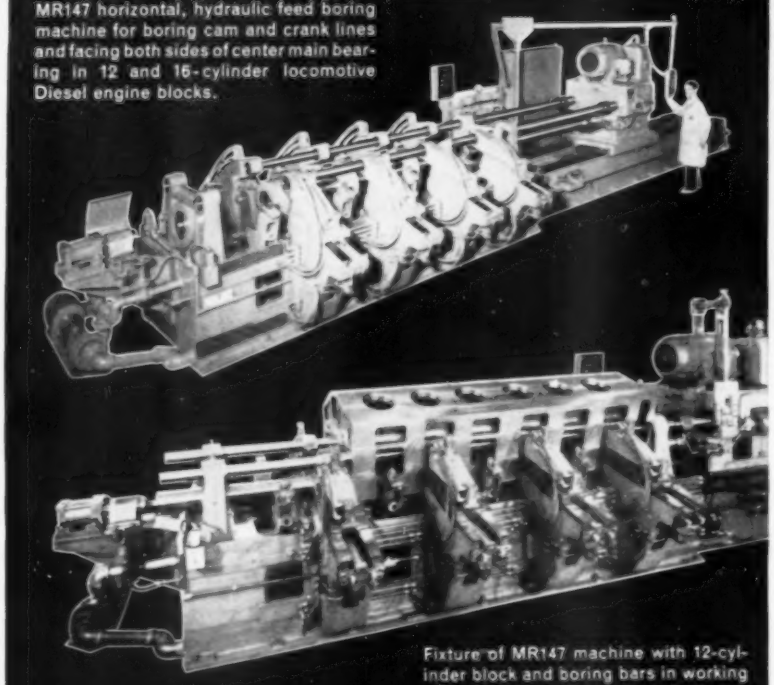

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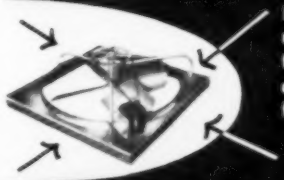

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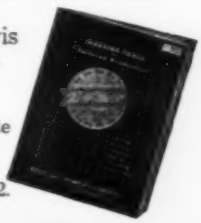

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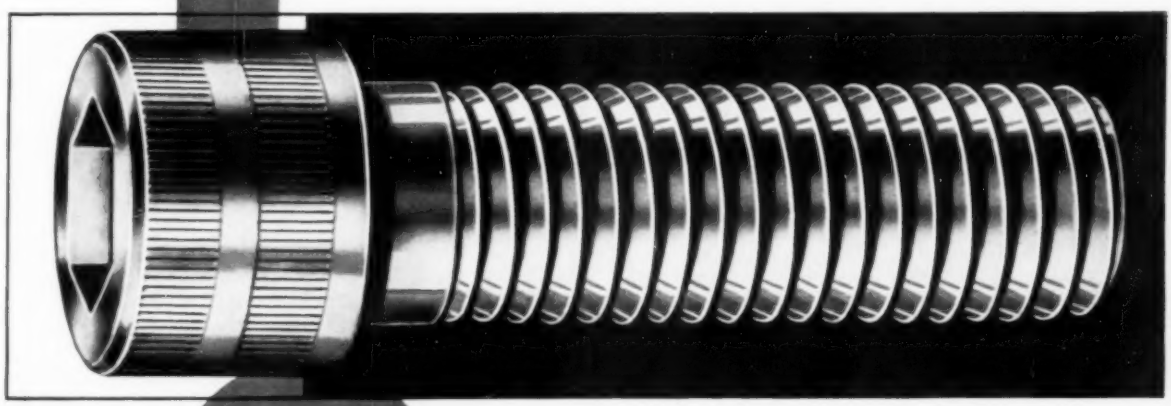

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